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A SHORT
PRACTICE OF GYNÆCOLOGY

BY

HENRY JELLETT, B.A., M.D., B.Ch., B.A.O. (Dublin University); F.R.C.P.I.

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126-60
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LONDON

J. & A. CHURCHILL

7 GREAT MARLBOROUGH STREET

1908

BRADBURY, AGNEW, & CO. LD., PRINTERS,
LONDON AND TONBRIDGE.

PREFACE TO THE THIRD EDITION.

THE present edition of "A Short Practice of Gynæcology" has been submitted to a careful revision throughout, so as to make it represent, as far as possible in a book of the size, the present state of gynæcological practice. In particular, the chapters dealing with operations have been largely rewritten, and much new matter added to them. My publishers have further consented to the addition of a large number of illustrations, for which concession I am very grateful, as it is impossible satisfactorily to describe gynæcological operations without the help of numerous illustrations. A number of the old illustrations have been redrawn.

The majority of the new drawings of operations were made from the dead subject by Mr. Sewill, and I am particularly indebted to Dr. Francis Dixon, Professor of Anatomy in Dublin University, for his kindness in placing subjects at my disposal for this purpose. I am also indebted to Dr. Rowlette, pathologist to Dr. Steevens' and the Rotunda Hospitals, for correcting the sections which deal with gynæcological pathology, and to Dr. Kirkpatrick and Dr. Drury for reading the proof sheets.

Messrs. Smith and Shepherd have kindly provided a number of wood blocks of instruments.

CONTENTS.

PAGE

CHAPTER I.

THE DIAGNOSIS OF GYNÆCOLOGICAL CASES.

The History of the Patient—Physical Examination: Pelvic Examination, Bimanual Examination, Combined Rectal and Vaginal Examination: Abdominal Examination—Diagnostic Instruments: Speculum, Tenaculum, Sound, Curette, Cervical Dilators, Microscope—Diagnostic Operations—Importance of Early Diagnosis . 1

CHAPTER II.

MENSTRUATION AND ITS DISORDERS.

Menstruation: Theories concerning—Amenorrhœa: Apparent, Actual—Menorrhagia and Metrorrhagia—Dysmenorrhœa: Membranous Dysmenorrhœa 18

CHAPTER III.

DISEASES OF THE BLADDER AND URETHRA.

The Bladder: Cystitis; Ætiology, Symptoms, Treatment, Tumours, Displacements, Vesical Fistulæ—The Urethra: Tumours—Prolapse of the Urethral Mucous Membrane 26

CHAPTER IV.

DISEASES OF THE VULVA AND PERINÆUM.

The Vulva. Vulvitis—Catarrhal Vulvitis—Exudative Vulvitis—Phlegmonous Vulvitis—Herpes—Eczema—Pruritus Vulvæ—Elephantiasis—Kraurosis Vulvæ—Tumours: Benign Neoplasms; Malignant Neoplasms, Carcinoma, Sarcoma—Hæmatoma—Retention Cysts—Herniæ—Hydrocele of the Canal of Nuck—Tuberculosis of the Vulva. The Perinæum 35

CHAPTER V.

DISEASES OF THE VAGINA.

Vaginitis—Catarrhal Vaginitis; Pathological Anatomy, Ætiology, Symptoms, Treatment, Complications—Exudative Vaginitis: Symptoms, Treatment—Phlegmonous Vaginitis; Symptoms, Treatment

PAGE

—Emphysematous Vaginitis—Vaginismus; Ætiology, Symptoms, Treatment—Tumours; Benign Neoplasms—Malignant Neoplasms; Carcinoma, Sarcoma, Endothelioma—Vaginal Cysts—Hæmatoma —Tuberculosis—Errors of Development. 49

CHAPTER VI.

DISEASES OF THE UTERUS.

Errors of Development: Congenital Absence of Uterus—Double or Bipartite Uterus, Treatment—Stenosis of the Cervical Canal, Symptoms, Treatment—Congenital Atrophy of the Uterus—Infantile Uterus—Congenital Atresia of the Cervix—Congenital Hypertrophy of the Cervix; Treatment 63

CHAPTER VII.

DISEASES OF THE UTERUS (*continued*).

Displacements of the Uterus. Terminology—Normal Position of the Uterus—Table of Displacements—Upward Displacement—Downward Displacements—Backward Displacements; Retroversion and Flexion; Retroposition—Forward Displacements; Anteversion and Flexion; Anteposition—Lateral Displacements of the Uterus; Dextro- or Sinistroversion or Flexion—Torsion—Inversion; Degrees, Varieties—Acute Inversion—Chronic Inversion . . 69

CHAPTER VIII.

DISEASES OF THE UTERUS (*continued*).

Traumata of the Uterus. Inflammatory Diseases of the Uterus—Corporeal Metritis: Acute; Ætiology, Pathology, Symptoms, Complications, Treatment: Chronic; Myometritis, Ætiology, Pathology, Symptoms, Treatment; Endometritis, Varieties, Ætiology, Pathology, Symptoms, Treatment—Cervical Metritis: Acute, Ætiology, Pathology, Symptoms, Complications, Treatment; Chronic, Ætiology, Pathology, Symptoms, Treatment . 121

CHAPTER IX.

DISEASES OF THE UTERUS (*continued*).

New Growths of the Uterus—Myomata; Ætiology, Pathological Anatomy, Secondary Changes, Symptoms, Diagnosis, Prognosis, Treatment—Malignant Neoplasms; Carcinoma of the Body; Pathological Anatomy, Symptoms, Diagnosis, Prognosis, Treatment: Carcinoma of the Cervix; Pathological Anatomy, Symptoms, Prognosis, Treatment: Sarcoma; Varieties, Pathological Anatomy, Symptoms, Diagnosis, Prognosis, Treatment: Endothelioma; Pathological Anatomy, Diagnosis, Treatment: Chorion-Epithelioma; Ætiology, Pathological Anatomy, Symptoms, Diagnosis, Treatment—Tuberculosis of the Uterus; Varieties, Diagnosis, Treatment 150

PAGE

CHAPTER X.

DISEASES OF THE FALLOPIAN TUBES.

Inflammatory Diseases of the Tubes. Salpingo-oöphoritis—Ætiology—Pathological Anatomy: Salpingitis—Acute Salpingitis—Chronic Salpingitis: Varieties—Cystic Changes in the Tube: Oöphoritis—Acute Oöphoritis—Chronic Oöphoritis—Symptoms—Diagnosis—Prognosis—Treatment, Palliative, Radical. New Growths of the Tubes: Benign Neoplasms—Malignant Neoplasms. Tuberculosis of the Tubes—Pathological Anatomy—Treatment. Tubal Pregnancy. Absence of the Appendages 190

CHAPTER XI.

DISEASES OF THE OVARIES.

Displacements of the Ovaries—Undescended Ovary—Hernia of the Ovary—Ascent of the Ovary—Descent of the Ovary—Inflammatory Diseases of the Ovary. New Growths of the Ovary—Retention Cysts—Epithelial Tumours—Mesoblastic Tumours—Dermoid Cysts and Teratomata—Complex Tumours—Tuberculosis of the Ovary 216

CHAPTER XII.

DISEASES OF THE PELVIC PERITONEUM AND OF THE UTERINE LIGAMENTS.

Pelvic Peritonitis: Pathological Anatomy, Bacteriology, Symptoms, Prognosis, Treatment—Pelvic Cellulitis: Pathological Anatomy, Symptoms, Diagnosis, Prognosis, Treatment—Tumours of the Broad Ligament—Cysts: Fibroma—Hæmatoma—Tumours of the Round Ligament—Cysts—Fibroma 239

CHAPTER XIII.

TRAUMATA OF THE GENITAL ORGANS.

Traumata which favour Prolapse—Symptoms—Diagnosis—Treatment. Traumata which cause Fistulæ—Varieties—Ætiology—Symptoms—Diagnosis—Treatment 248

CHAPTER XIV.

GENITAL ATRESIÆ.

Genital Atresiæ: Varieties—Symptoms—Diagnosis—Prognosis—Treatment 260

CHAPTER XV.

INTERNAL HÆMORRHAGE OF GENITAL ORIGIN.

Intra-peritoneal Hæmorrhage—Ætiology—Symptoms—Diagnosis—Prognosis—Treatment. Extra-peritoneal Hæmorrhage—Symptoms—Diagnosis—Treatment 264

PAGE

CHAPTER XVI.

GYNÆCOLOGICAL OPERATIONS.

Definitions — Sterile — Aseptic — Antiseptic — Surgical Cleanliness — Sterilisation. Preparation of the Operating Room—Dressings—Gloves—Sponges — Instruments — Catheters — Suture Materials — Preparation of Patient — Preparation of the Operator and his Assistants — Antiseptics — Operating Table and Gynæcological Couch 271

CHAPTER XVII.

CŒLIOTOMY.

Definition—Ventral Cœliotomy—Indications, Instruments, Operation: Drainage; Closure of the Abdominal Wound; Kelly's Method——Operative Complications—After-treatment; Rest, Diet, Bladder, Intestinal Tract, Dressing of Wound—Post-operative Complications—Vaginal Cœliotomy—Relative Advantages of Vaginal and Abdominal Cœliotomy — Indications, Instruments, Operations; Anterior Colpotomy, Mackenrodt's Operation, Dührssen's Operation; Posterior Colpotomy—Paravaginal Section 285

CHAPTER XVIII.

OPERATIONS ON THE URETHRA AND BLADDER.

Removal of an Urethral Caruncle. Excision of Prolapsed Urethra. Dudley's Operation for Urinary Incontinence. Operations for the Cure of Vesico-vaginal Fistula; Marion Sims', Sänger's, Rutherford Morison's, Dudley's, Mackenrodt's, Trendelenburg's—Vesico-cervical and -uterine Fistulæ—Urethral and Ureteral Fistulæ—Artificial Vesico-vaginal Fistula. Cystoscopy—Kelly's Cystoscope —Nitze's Cystoscope 322

CHAPTER XIX.

OPERATIONS ON THE VULVA, PERINÆUM, AND VAGINA.

Operations on the Vulva: Amputation of the Clitoris—Removal of Bartholin's Gland: Solid Tumours of the Labium: Imperforate Hymen—Operation for Relief of Pruritus Vulvæ. Operations on the Perinæum and Vagina: Perinæorrhaphy and Colpo-perinæorrhaphy —Incomplete Perinæorrhaphy and Colpo-perinæorrhaphy; Lawson Tait's, Modification of Lawson Tait's, Martin's, Kelly's, Hegar's—Complete Perinæorrhaphy and Colpo-perinæorrhaphy; Lawson Tait's, Hegar's: Anterior Colporrhaphy: Removal of Solid Vaginal Tumours: Removal of Vaginal Cysts: Atresia of the Vagina. Colpocleisis 344

PAGE

CHAPTER XX.

MINOR OPERATIONS ON THE UTERUS.

Dilatation of the Cervix; Gradual Dilatation, Rapid Dilatation—Curetting—Amputation of the Cervix: Supra-vaginal Amputation, Amputation of the Vaginal Portion—Trachelorrhaphy; Sänger's, Emmet's—Division of the Cervix; Bilateral Division, Posterior Division—Atmocausis and Zestocausis. Removal of Submucous Myomata—Curetting and Cauterisation of Irremovable Malignant Disease—Reposition of Adherent Retro-deviated Uterus . . 374

CHAPTER XXI.

MAJOR OPERATIONS ON THE UTERUS.

Hysterectomy: Ventral Hysterectomy: Partial Hysterectomy; Schroeder's, Kelly's — Vertical Bisection of Uterus — Horizontal Bisection of Uterus: Total Hysterectomy; Doyen's, Kelly's, Werder's: Vaginal Hysterectomy: Without Mutilation of Uterus; Suture Operation, Clamp Operation: With Mutilation of Uterus; By Median Incision, By Morcellation. Myomectomy and Enucleation. Hysteropexy—Ventral Suspension, Kelly's, Olshausen's; Ventral Fixation, Kelly's, Kocher's. Vaginal Hysteropexy, Mackenrodt's, Dührssen's, Vineberg's. Radial Cure of Inversion . 411

CHAPTER XXII.

OPERATIONS ON THE TUBES AND OVARIES.

Salpingectomy—Indications — Instruments — Operation — After-treatment. Salpingostomy — Indications — Instruments — Operation. Ovariotomy—Indications — Instruments — Operation — Complications—After-treatment. Oöphorectomy, Salpingo-oöphorectomy —Indications—Instruments—Operation. Resection of the Ovary and Ignipuncture—Indications—Instruments—Operation . . 474

CHAPTER XXIII.

OPERATIONS ON THE UTERINE LIGAMENTS AND PELVIC PERITONEUM.

Shortening of the Utero-sacral Ligaments—Intra-peritoneal Shortening —Extra-peritoneal Shortening—Shortening of the Round Ligaments—Indications—Instruments—Extra-peritoneal Shortening, Intra-peritoneal Shortening — Complications — After-treatment. Vaginal Incision and Drainage—Indications—Instruments—Operation — After-treatment — Complications. Radical Treatment of Peritoneal Adhesions—Instruments—Operation—After-treatment. 494

INDEX 511

A SHORT
PRACTICE OF GYNÆCOLOGY.

CHAPTER I.

THE DIAGNOSIS OF GYNÆCOLOGICAL CASES.

The History of the Patient—Physical Examination : Pelvic Examination, Bimanual Examination, Combined Rectal and Vaginal Examination : Abdominal Examination—Diagnostic Instruments : Speculum, Tenaculum, Sound, Curette, Cervical Dilators, Microscope—Diagnostic Operations—Importance of Early Diagnosis.

A DIAGNOSIS is reached in gynæcological cases first by ascertaining the history of the patient, and then by making a careful and complete physical examination. The relative value of the information obtained respectively by these two methods differs in different cases. The history of the patient is always of importance, inasmuch as it tells us of what she is complaining, that is what her subjective symptoms are, but it is seldom that an accurate diagnosis can be made from it. Gynæcological conditions, differing widely in pathology and in clinical importance, tend to cause symptoms which are identical in general character, which differ only to a small extent in degree, and which consequently will not form a sound basis for accurate diagnosis. The physical examination, on the other hand, if thoroughly and systematically carried out, is of extreme importance, and enables the cause of the particular group of symptoms to be discovered.

I. THE HISTORY OF THE PATIENT.—In eliciting the history of the patient, the following are the principal points on which information must be obtained :—

(1) *Her Age.*—The life of a woman can be divided into certain

periods which have an important bearing on her symptoms and physical condition, and on gynæcological treatment. These periods are as follows :—

(*a*) Infancy and childhood. This period lasts from birth to puberty, and during it the sexual organs are dormant, so that, so far as they are concerned, the child is asexual.

(*b*) Puberty. Puberty is the term applied to the commencement of the sexual life of the woman. The age at which it occurs differs considerably in different countries, and is affected by climate, mode of life, and race. As a general rule, it occurs earlier in hot countries, and later in cold countries; earlier in girls who live in a city or in affluent circumstances, later in those who live in the country or in poor circumstances; earlier in the Latin races, later in the Anglo-Saxon. In these countries, puberty usually occurs between the ages of thirteen and sixteen. Its onset is characterised by a rapid development of the breasts and genital organs, by the occurrence of menstruation, by changes in the outline of the figure due to the increased deposit of fat, and by alterations in the habits and inclinations.

(*c*) Nubility. Nubility is the term applied to the period of sexual activity during which childbirth may occur. It lasts from puberty to the menopause. The first few years of this period are characterised by progressive development of the sexual organs, the last year or two by gradual retrograde changes which take place in them, and the intervening years by full activity.

(*d*) Menopause. The menopause is the term applied to the period of cessation of menstruation and sexual activity. The exact age at which it occurs varies in different women within considerable limits. As a rule it comes on between forty-five and fifty, while the average age is said to be forty-seven, *i.e.*, thirty-three years after puberty. It is characterised by the cessation of menstruation, by the gradual loss of the sexual appetite, and, in some women, by slight nervous disturbances.

(*e*) Post-climacteric period. This is the concluding period

of a woman's life, and extends from the menopause to death. It is characterised by atrophy of the genital organs.

(2) *Is she single, married, or a widow?*—If married, for how long? If a widow, for how long was she married, and for how long is she a widow? The state of life of a woman is important as showing that she is, or is not, exposed to some of the causes of genital disease. For a similar reason, if she is married, one must ascertain if she lives with her husband, and, if not, how long an interval has elapsed since she last did so.

(3) *Number and Nature of Pregnancies.*—In addition to ascertaining the number of pregnancies, information must be obtained regarding their nature and the nature of the respective labours. With this object, the following points must be ascertained:—

(*a*) Duration of pregnancies, *i.e.*, number of abortions, immature or premature births, and full-term labours.

(*b*) Nature of labours, *i.e.*, normal, prolonged, or instrumental; nature of complications, if any.

(*c*) Nature of the puerperium, *i.e.*, a rapid convalescence and a complete recovery, or a protracted convalescence; if the latter, the cause of protraction.

(*d*) Time since the birth of the last child. If pregnant at present, for how long?

(4) *Menstrual History.*—The menstrual history is a most important part of the information afforded by the patient. Information on the following points should be elicited:—

(*a*) The age at which menstruation commenced.

(*b*) The usual interval between the periods, and the occurrence of any variations in it. The usual interval is about twenty-four days from the end of one period to the commencement of the next.

(*c*) Amount of discharge, whether normal, excessive (menorrhagia), scanty, or absent (amenorrhœa). It is often difficult to determine with any exactness what a woman means by saying that the discharge is natural, excessive, or slight in amount. Every woman is more or less a rule to herself, and usually when she says that the loss at a period was natural, excessive (menorrhagia), or slight in amount, she means that the amount was the

same as, was greater than, or was less than, it habitually is. Some more definite idea of the amount of the discharge may be obtained by inquiring into the number of napkins used daily during the period, and the extent to which each was soiled. The average amount is from four to six ounces.

(*d*) The usual duration of the period. The duration of the period varies considerably in different women, even in perfect health. The usual duration is from four to five days.

(*e*) The occurrence of pain. A varying degree of discomfort or even actual pain (dysmenorrhœa) occurs in a considerable proportion of women, who otherwise appear to menstruate normally and are apparently in perfect health. Pain, however, must be regarded as pathological when it is sufficient to interfere with the avocations of the woman or with her general health.

(*f*) The passage of clots. Normal menstrual discharge should not contain clots. Their presence is always pathological.

(*g*) The occurrence of a discharge of blood between the periods. This never occurs in health ; it is a symptom of many of the graver forms of uterine disease, and is known as metrorrhagia.

(*h*) The date of last menstruation. This is of considerable importance, as it points to, or excludes, the probability of pregnancy.

(5) *The Presence of Vaginal Discharge.*—The presence of a white or yellow vaginal discharge (leucorrhœa) is a symptom common to many forms of vaginal and uterine disease. It usually is mucoid or muco-purulent in character, but in some cases is watery or contains blood.

(6) *The Existence of Pain.*—The occurrence of pain, apart from that limited to the menstrual period, must be ascertained, and also its site, degree of intensity, whether continuous or intermittent, and, if intermittent, when and how often it occurs.

(7) *The General Health.*—In addition to determining the presence of special symptoms—the result of genital disease, the presence of any symptoms suggestive of disease of any other

part of the body, such as of the cardiac, respiratory, digestive, and urinary systems, must also be ascertained.

II. The Physical Examination.—The information obtained from the physical examination of the patient is even more important than that obtained from her history. The latter tells the symptoms the patient requires to be cured of, and in most cases furnishes at least a clue to the nature of the case; but for the exact diagnosis of the condition of affairs present the physical examination has to be almost entirely relied upon. The physical examination naturally falls under two heads :—

(1) Abdominal examination.

(2) Pelvic examination.

(1) *Abdominal Examination.*—If we exclude the examination of organs other than pelvic, abdominal examination is only of use in gynæcological cases when the abdomen is occupied by a tumour which has risen above the pelvic brim, or when the abdomen is distended by fluid. In such cases we can obtain by its means, first, a diagnosis between a tumour and ascites, and secondly, if the presence of a tumour is determined, some information with regard to its size, consistency, outline, and connections with the other abdominal contents. Abdominal examination is of special assistance in distinguishing between large uterine or ovarian tumours and a pregnant uterus, an enlarged kidney or spleen, or other tumour of the abdominal as opposed to the pelvic viscera.

(2) *Pelvic Examination.*—A thorough pelvic examination is essential in all gynæcological cases, and, in order to carry it out satisfactorily, the patient must lie in the dorsal position on a suitable couch, and the abdominal walls must be relaxed. If it is impossible to procure sufficient relaxation without an anæsthetic, the latter must be administered. In all cases the bladder must be empty, and also, if possible, the intestines. Until recently, the most suitable gynæcological couch was the "Veit-Schroeder," or some modification of it (*v.* Fig. 1), but now numerous forms of metal gynæcological "tables" or "chairs" are made, most of which are very suitable for their purpose. If, however, a special couch is not available, a satisfactory pelvic examination can be made while the patient lies on her back on a low couch or bed with her thorax raised

and her knees drawn up, so as to obtain the maximum relaxation of the abdominal wall.

Vaginal examination alone is not of such importance in gynæcological as in obstetrical work. By its means the condition of the perinæum, the vagina, and of the cervix can be determined, but beyond this little information is obtainable.

The mode of examination on which we almost entirely rely for pelvic information is "bimanual examination." This is carried out as follows:—Place the patient on a gynæcological couch, if one is available, her knees flexed over the knee rests, and her buttocks at the front edge of the seat, and then stand between

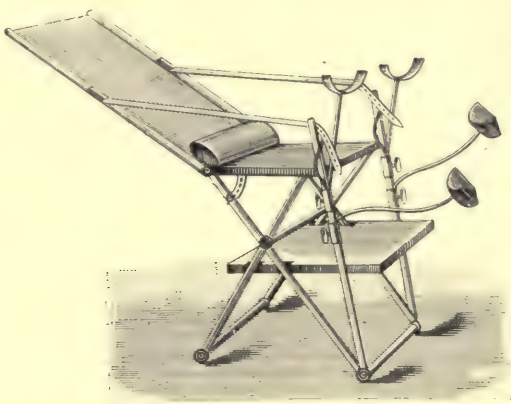


FIG. 1.—Veit-Schroeder gynæcological couch.

the knees with the right foot upon the stool of the couch. Having ascertained that the bladder is empty, introduce the index finger of the right hand into the vagina, keeping it pressed against the perinæum, and pass it upwards into the anterior fornix. At the same time the elbow must rest upon the right knee, in order that the weight of the arm may be supported. The fingers of the left hand are then laid flat upon the abdominal wall in the middle line, the tips reaching halfway up to the umbilicus. The tips of the fingers are pressed backwards in the direction of the promontory of the sacrum, in such a manner that the fingers roof over, as it were, the pelvic cavity. Now, by endeavouring to approximate these with the finger in the vagina, we can feel that something lies between them (*v.* Fig. 2). By gently rotating the external fingers, we are able to map out the outlines of

the intervening object, and to determine in a normal case that it is the uterus. If the finger in the vagina is not of sufficient length, by inserting the middle finger also we are enabled to reach some half an inch higher. If we approximate the fingers without finding any resisting body between them, we should

FIG. 2.—Method of making a bimanual examination.

withdraw the vaginal fingers from the anterior fornix and place them directly under the cervix. Then, by pushing the cervix upwards in the direction of the external fingers, the entire uterus, if it is in front, is lifted up towards the abdominal wall, and is more easily felt. If the uterus is lying posteriorly, the cervix, and its junction with the body, alone are felt. Next,

the vaginal fingers are passed into the posterior fornix, and, using the external fingers as before, the contents of Douglas'

FIG. 3.—The external genitals in a virgin. L.Ma. Labium majus. L.Mi. Labium minus. C. Clitoris. U. Urethral orifice. H. Hymen. V. Vaginal orifice. F. Posterior fourchette. P. Perinæum.

pouch are examined. In order to palpate the ovaries, the vaginal fingers are placed in one or other lateral fornix, and

approximated to the external fingers. If the ovary is not at once felt between them, both hands are drawn slowly and gently downwards towards the anterior wall of the pelvis and parallel

FIG. 4.—The muscles of the pelvic floor as seen from below. (*Kelly.*)

with the conjugate diameter of the brim. The ovary of the same side will then be felt to slip between the fingers. The opposite ovary can be felt by examining at the opposite side in a similar manner. If the ovaries are not felt at first, the fingers

should be again drawn down as before, but keeping closer to the pelvic brim or to the uterus, so as to travel over fresh ground. It is usually considered best to examine the right adnexa with

FIG. 5.—Sagittal section through adult body, showing the normal position and relations of the uterus, bladder, rectum, and abdominal walls. The intestines are not shown, and the dotted line represents the outline of the pelvic bones. Note the proximity of the anterior abdominal wall to the sacral promontory. (*Kelly.*)

the fingers of the right hand in the vagina, and the left adnexa with the fingers of the opposite hand. The great essentials necessary to make a successful bimanual examination are to induce the patient to relax the abdominal muscles or to obtain relaxation by anæsthesia, to be sure that the bladder and intestines

are empty, and to make all movements with extreme gentleness, avoiding as far as possible any unnecessary movements of the vaginal fingers.

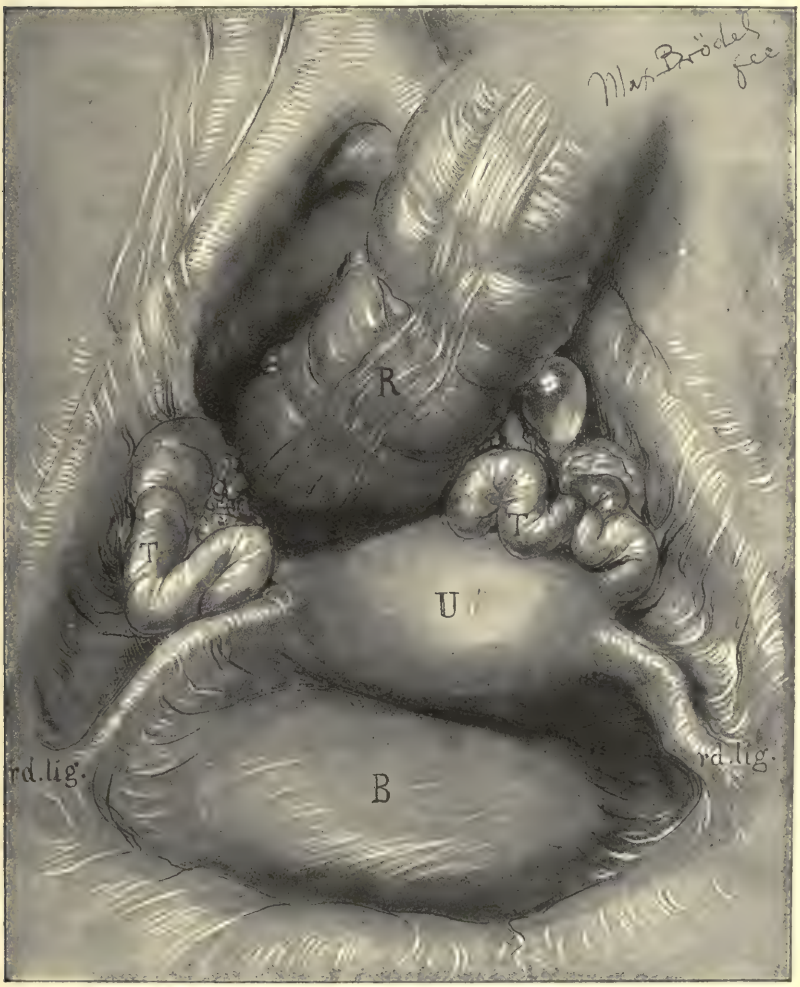


FIG. 6.—The relations of the pelvic viscera as seen from above. (*Kelly.*)

A modification of this method of examination, and one which often enables us to obtain more information, is to make the examination as an abdomino-vagino-rectal examination instead of as an abdomino-vaginal examination. This is carried out in the same manner as

the previous method, with the exception that the middle finger of the right hand is passed into the rectum, the index finger being kept in the vagina. In this way it is possible to tell not only what lies between the roof of the vagina and the abdominal wall, but also at the same time what lies between the vagina and the rectum.

It must not be forgotten that, in addition to the abdominal and pelvic examination, a thorough physical examination must be made in all cases with a view to determining the condition of the cardiac, respiratory, urinary, and digestive organs.

The latero-prone position, also known as Marion Sims' position, as he was the first to describe it, is still used by some gynæcologists, both for the purpose of making a pelvic examination, and for performing certain vaginal operations. For the benefit of those who desire to follow in the steps of their predecessors, we shall describe this method; but, although we fully recognise the very great advance which it constituted over the existing methods at the time at which it was introduced, we cannot recommend practitioners to adopt it or students to learn how to perform it at the present day. It is a method of considerable academic interest, but of little or no practical importance.

In order to examine a patient in this manner, a special speculum is required—Marion Sims' duck-billed speculum, and the patient is placed in a special position, the latero-prone or Marion Sims position. The description of the examination, as given by Marion Sims himself, is as follows :—"For a speculum examination, the patient is to lie on the left side. The thighs are to be flexed at about right angles with the pelvis, the right being drawn up a little more than the left. The left arm is thrown behind across the back, and the chest rotated forwards, bringing the sternum very nearly in contact with the table, while the spine is fully extended, with the head resting on the left parietal bone. The head must not be flexed on the sternum, nor the right shoulder elevated. Indeed, the position must simulate that on the knees as much as possible, and for this reason the patient is rolled over on the front, making it a left lateral semi-prone position. The nurse or assistant standing at her back pulls up the right side of the nates with the left hand, when the surgeon introduces the speculum, elevates the perinæum, and gives the instrument into the right hand of the assistant, who holds it

firmly in the desired position." The speculum is introduced under the guidance of the right index finger, and care is taken that it does not catch against the cervix. "If the patient then breathes easily, the vagina will be immediately distended by the pressure of the atmosphere, so as to bring the neck of the uterus, the posterior *cul-de-sac*, and the whole of the anterior wall of the vagina into view, without the least traction, pressure, or suffering."

If the chief object of a pelvic examination was to inspect the vaginal mucous membrane and the vaginal portion of the cervix, Marion Sims' position would be invaluable. As, however, we now recognise that the most important lesions in gynæcological diseases lie beyond the vagina, its value as a diagnostic aid is small.

Many gynæcologists still adopt the old method of examination of the patient on the side, and we know of some who even go so far as to say that they have re-adopted it after trying and abandoning the dorsal position. There is little doubt that a great deal of information can be obtained, and a great deal can be done, with the patient in this position, just as, if necessary, a skilled laryngologist can examine and remove a patient's tonsils with the patient lying on her side, but there is less doubt that such positions hamper examination. Why it should do so in the case of the pelvic organs is obvious. In the first place, when the patient lies upon her side there is a perceptible temporary displacement of the pelvic viscera towards that side, and in estimating the result of an examination this displacement has to be allowed for; and, in the second place, it is impossible to make a bimanual examination with the patient in such a position. Now a bimanual examination is the most important method of examining the contents of the pelvis, short of direct inspection, and in no case can we afford to dispense with it. We therefore strongly advise students to accustom themselves to examine gynæcological patients in the dorsal position, and to take every opportunity of so doing.

Diagnostic Instruments.—Amongst the more important instruments which are used for diagnostic purposes are the following:—

Speculum.—A suitable speculum is necessary in order to ascertain the condition of the vaginal or cervical mucous membrane.

The most serviceable form for this purpose is Fergusson's cylindrical speculum or some modification of it (*v.* Fig. 7). It must be made of metal or of porcelain, to enable it to be sterilised by boiling. Another form, which is sometimes more easily used as it is self-retaining, is Nott's trivalve speculum (*v.* Fig. 8). This is composed of three blades, which approximately form arcs of

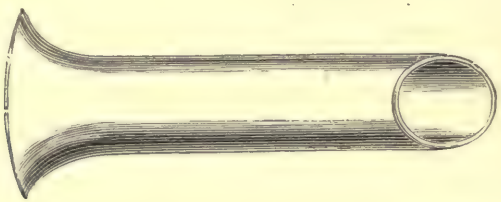


FIG. 7.—Cylindrical speculum made in metal after Fergusson's model.

the same circle. It is inserted with the three blades in apposition with one another, and when in position in the vagina these are made to diverge eccentrically by means of a screw. A long posterior speculum may also be used, but, if so, it will be necessary to catch and draw down the cervix with a volsellum in order to expose it sufficiently.

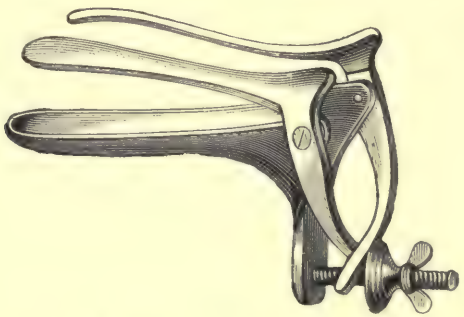


FIG. 8.—Nott's trivalve speculum, almost ½ scale.

Volsellum.—The most generally used form of volsellum is that known as an American bullet forceps (*v.* Fig. 9). Such an instrument is required for fixing the cervix or drawing it down into view.

Sound.—A uterine sound is of use for ascertaining the position of the uterus when it is impossible to do so by a bimanual examination. It is also used for ascertaining the length and size

of the uterine cavity, the presence of an abnormal formation of the uterus—as double uterus or the like, and the existence and outline of intra-uterine tumours. The sound, like many other things, has fallen into a certain amount of disrepute owing to its too frequent and too incautious use in the past. When it is introduced through a septic vagina into the uterine cavity it is undoubtedly a dangerous instrument. It must be remembered that, if it is to be used with safety, the vagina must first be thoroughly douched and disinfected, or else the sound must be passed through the latter in such a manner that it does not come in contact with the mucous membrane of the vagina.

Curette.—A curette (*v.* Figs. 205—208) is a serviceable instrument for ascertaining the nature of obscure conditions of the uterine mucous membrane, inasmuch as it enables us to bring

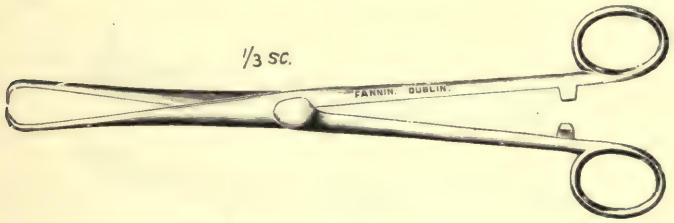


FIG. 9.—American bullet forceps.

away a small portion of the latter, which can then be examined under the microscope. By its timely use in cases of uterine hæmorrhage, malignant disease can be recognised in its early stage, and thus the most favourable chance given for successful operative interference.

Cervical Dilators.—Cervical dilators of some form are required in almost all cases in which it is considered necessary to remove with the curette a portion of the mucous membrane for examination, or to pass the finger into the uterus in order to ascertain the nature of the contents. They may be divided into two classes —those which act slowly, and those which act rapidly.

In the first class, come the so-called "tents" and hydrostatic dilators. A tent is the name applied to cylindrical rods of different sizes made from various absorbent substances, which tend to increase in size as they imbibe moisture. The commonest, and the safest to use, as they can be most easily sterilised, are made from sea-tangle (*Laminaria digitata*). These are sterilised

by prolonged immersion in absolute alcohol and corrosive sublimate (one per cent. solution), or in the author's catgut steriliser (*v.* page 275). Before use they are immersed, for a second, in water. They are then passed into the cervix, taking care that they traverse the internal os. The number used depends upon their size and upon the initial capacity of the cervical canal. It is better to use a number of small tents than one or two large ones, and as a rule as many are inserted as the cervix will hold without any forcing. They produce their maximum amount of dilatation within twelve to twenty-four hours, and, if a further amount of dilatation is required, the first set is removed and a larger number inserted (*v.* page 376). Tupelo-wood tents are sometimes used as a substitute for laminaria. They can be obtained of a larger size than can the latter, and are said to expand more uniformly. They are sterilised in corrosive sublimate and alcohol

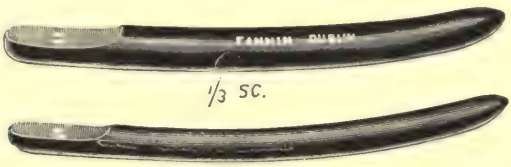


FIG. 10.—Hegar's dilators.

as described. Tents are also made of sponge, but their use is inadmissible on account of the difficulty of sterilisation. Hydrostatic dilators—of which Barnes' bag is a type—are very rarely used in gynæcological practice. A third method of gradual dilatation, but one which is very much slower than the foregoing, is the introduction of a succession of firm tamponades of iodoform gauze into the uterine cavity. Each tamponade is left in for from twenty-four to forty-eight hours, and the process usually requires to be repeated some six or eight times in order to obtain sufficient dilatation. During this process, it is not necessary to confine the patient to bed, as is the case when tents are used, and this in itself is sometimes of advantage.

In the second class of cervical dilators are included Hegar's dilators and their various modifications. Hegar's dilators are made of vulcanite or metal, in twenty-six sizes (*v.* Fig. 10). They are graduated from No. 1, which is about the size of a coarse knitting-needle, up to No. 26, and the numbers correspond

to their diameter in millimetres. In order to introduce them, the cervix is exposed by passing a posterior speculum, and is seized in a bullet forceps and drawn down. Then, after ascertaining the direction of the cervical canal by means of a sound, the largest dilator, which the cervix will admit, is introduced. This is followed after a few seconds' interval by the next in size, and so on until the required degree of dilatation is obtained. These dilators furnish the most satisfactory means of obtaining the degree of dilatation necessary for curetting, *i.e.*, about up to No. 10; after this, however, they tend to tear the cervix unless it is unusually dilatable (*v.* page 376).

The Microscope.—It is impossible to deal here with the use of the microscope for diagnostic purposes, and it is only necessary to call attention to the great value of microscopical examination in diagnosing malignant disease in its early stages, and tubercular disease at almost any stage.

Diagnostic Operations.—In some cases of obscure intra-peritoneal disease, the only method of making a diagnosis is by means of a cœliotomy, *i.e.*, the opening of the abdominal cavity. Such a cœliotomy may be performed through the abdominal wall or through the vagina.

The digital or instrumental exploration of the uterine cavity, the removal of the endometrium, or of a portion of some cervical or vaginal tumour for microscopical examination, and the digital or ocular examination of the bladder, must also be included under this heading as minor diagnostic operations.

Before leaving the subject of diagnosis, we should like to insist on the necessity of making an accurate diagnosis of all cases of uterine hæmorrhage, and of abdominal tumours, at the earliest possible moment. Nothing has so contributed to the comparative failure of the operative treatment of malignant disease in the past as the neglect of this precaution.

CHAPTER II.

MENSTRUATION AND ITS DISORDERS.

Menstruation : Theories concerning—Amenorrhœa : Apparent, Actual—Menorrhagia and Metrorrhagia—Dysmenorrhœa : Membranous Dysmenorrhœa.

THERE are many objections to the plan usually followed in gynæcological handbooks of devoting a chapter to the disorders of menstruation. These disorders are purely symptomatic, and, when they are described in a separate chapter, students are only too likely to consider them as definite diseases, and to be quite satisfied with making a diagnosis of "menorrhagia," or "amenorrhœa," or "metrorrhagia," as the case may be, without paying any attention to the preceding causes of the condition. At the same time, it is very difficult to convey a knowledge of these disorders without making a definite attempt to classify their causes and varieties. On the whole, it is probably better to include such a chapter, limiting it, however, as far as possible to a statement of the varieties and causes of these disorders, and discussing the treatment in another place.

Before considering the disorders of menstruation, it is necessary to have some knowledge of the physiology of this process.

MENSTRUATION.

Menstruation (*menstrualis*, monthly) is the term applied to the periodical escape of blood from the uterus, which escape takes place physiologically every fourth week from puberty to the menopause, except during pregnancy and lactation. In these countries, puberty, as a rule, occurs between the ages of thirteen and sixteen. In hot countries, on the other hand, it comes on at an earlier, and in cold countries at a later date. The menopause usually comes on about thirty-three years after puberty, that is some time between forty-five and fifty. The menstrual discharge consists at first of mucus from the uterine and cervical glands,

and then of venous blood—which is prevented from clotting owing to its mixture with the acid vaginal discharge, and of fragments of endometrium which are undergoing degeneration. It varies in amount from four to six ounces, and its discharge lasts normally from four to five days. In the amount of the discharge, the attendant symptoms, the duration of the period, and the interval between the periods, every woman is a law to herself.

It would be impossible to give an account of all the different theories which have been advanced to account for the changes which take place during, or in association with, menstruation, and to account for the process itself. In the following description Bland-Sutton's teaching is followed.

The principal changes, which take place during or in association with menstruation, are to be found in the ovaries and in the uterus. In the ovaries, the process known as ovulation—that is, the ripening and escape of an ovum from the ovary—takes place. Usually the ovum, after it has escaped from the ovary, enters the Fallopian tube and is carried along it into the uterus. If the ovum is fertilised, it develops into an embryo ; if it is not fertilised, it is perhaps carried off in the menstrual discharge. The exact relationship in point of time between ovulation and menstruation is not very clear, but, in all probability, the ovum enters the uterine cavity either just prior to, or during, menstruation.

In the uterus, the following changes take place during menstruation :—" The mucosa of the non-menstruating uterus is composed of a stroma containing numerous glands and blood-vessels, and covered by a single layer of cubical epithelium. Shortly before menstruation begins, the stroma cells proliferate and the superficial vessels become dilated ; with increased congestion, the dilated capillaries break down and blood is extravasated into the superficial parts of the stroma under the epithelium. Later, the epithelium gives way, probably in part from a degenerative change, and is cast off along with portions of the stroma and of the glandular epithelium. The *débris* passes out with the menstrual fluid. After a time, regeneration of the mucosal surfaces takes place by the reproduction of epithelium partly from the torn edges of the glands and partly by the transformation of stroma elements " (Bland-Sutton).

Other writers do not consider that there is much actual destruction of tissue. Thus, Whitridge Williams writes: "It would seem evident that menstruation is not attended by any great loss of tissue, but consists essentially in marked hypertrophy of the mucosa, engorgement of its superficial vessels, and the consequent escape of blood, partly following rupture, but in a great measure by diapedesis. After the menstrual flow has ceased, a certain amount of degeneration takes place in the superficial layers of the mucosa, which however is soon repaired."

The proliferation of the stroma of the endometrium, which takes place prior to each menstrual period, may be perhaps regarded as a periodical attempt to prepare a suitable nidus for the possible advent of an impregnated ovum. If there is no such ovum to make use of the uterus thus prepared for its reception, degenerative changes occur in the mucous membrane, followed by regeneration. Then comes a period of quiescence, and then a new ante-menstrual period of proliferation.

The best explanation of the regular four-weekly recurrence of menstruation is that menstruation is a cyclical process, exactly as is respiration or the action of the heart. The respiratory cycle lasts for four seconds, the cardiac cycle for a little less than one second, while the generative cycle lasts for four weeks.

AMENORRHŒA.

Amenorrhœa (ἀ, negative; μήν, a month; ῥέω, I flow) is the term applied to the non-appearance or disappearance of the menstrual discharge during the normal "menstrual life" of a woman. This disappearance may occur as a physiological or as a pathological process. It is a physiological process when it occurs as the result of pregnancy or lactation; it is a pathological process when it results from either local or general disease.

Pathological amenorrhœa, with which we are alone concerned, may be divided into two classes:—

(A) Apparent amenorrhœa.

(B) Actual amenorrhœa.

(A) **Apparent Amenorrhœa.**—By apparent amenorrhœa, or cryptomenorrhœa (κρυπτός, hidden; μήν; ῥέω), is meant that

there is no external appearance of menstrual discharge, although the ordinary menstrual changes are taking place inside the uterus in the usual manner. Such a condition is the result of an obstruction, congenital or acquired, to the outflow of the menstrual fluid. Obstruction is usually caused by an imperforate hymen; rarely it arises as a result of congenital occlusion of the vagina or cervix, or from acquired obstruction of these passages due to their cicatricial obliteration (*v.* page 260).

(B) **Actual Amenorrhœa.**—By actual amenorrhœa is meant that there is a complete cessation, either temporary or permanent, of the physiological escape of blood from the uterine blood-vessels. It must, however, be borne in mind that the occurrence of actual amenorrhœa does not by any means imply that ovulation is not going on in a normal manner. In some cases this latter process is completely suppressed, if it had ever started; in other cases it continues, although there may be no menstrual discharge associated with it.

As menstruation is dependent on the healthy condition of three of the great systems of the body, it follows that any interference with the functions of these systems may bring about amenorrhœa. These three systems are:—

(1) The generative system.
(2) The circulatory system.
(3) The nervous system.

(1) *The Generative System.*—Amenorrhœa occurring as the result of pathological conditions of the generative system may be due to:—

(*a*) Congenital absence of uterus or ovaries.
(*b*) Removal of uterus or ovaries by operation.
(*c*) Atrophy of ovaries or endometrium or complete destruction by inflammatory disease, by new growths, or after parturition (hyperinvolution).

(2) *The Circulatory System.*—All diseases or conditions in which the amount of blood is lessened or altered in quality tend to produce amenorrhœa. The chief of these are anæmia, chlorosis, leucocythæmia, and all conditions which give rise to profuse or frequently repeated hæmorrhages. All debilitating conditions will also come into this list. They probably produce amenorrhœa either by interfering with the quality or quantity of the blood owing to the accompanying diminished nutrition, or, by weakening

the action of the heart and lowering the blood-pressure, they render the capillary vessels of the uterus less likely to rupture in the ordinary manner. Amongst such conditions may be mentioned tuberculosis, malignant disease, the final stages of cardiac and renal disease, debilitating fevers during the period of pyrexia and of convalescence, and various toxic conditions, as in chronic poisoning by lead, mercury, morphia, and alcohol (Labadie-Lagrave).

(3) *The Nervous System.*—Exophthalmic goitre, general paralysis, and other forms of nervous disease frequently produce amenorrhœa. So-called "reflex amenorrhœa" is said to be caused by sudden chills, iced drinks, or cold baths, just before the appearance of the flow. Such conditions may give rise to a very temporary amenorrhœa lasting for one period; but it is difficult to understand how they could produce a more permanent effect. Finally, there is the condition known as "sympathetic amenorrhœa" (Labadie-Lagrave), *i.e.* amenorrhœa occurring in patients who are very anxious to believe themselves to be pregnant, or who are persuaded that they have reached the menopause—auto-suggestion (Pozzi).

MENORRHAGIA AND METRORRHAGIA.

Menorrhagia (*μήν*; *ῥήγνυμι*, I burst forth) is the term applied to excessive menstrual discharge. Metrorrhagia (*μήτρα*, the womb; *ῥήγνυμι*) is the term applied to hæmorrhage occurring between the normal periods of menstruation. It is most frequently found in association with menorrhagia. As in the case of amenorrhœa, the causes of menorrhagia and metrorrhagia may be divided into those arising in:—

(1) The genital system.
(2) The circulatory system.
(3) The nervous system.

(1) *The Genital System.*—All the causes of menorrhagia and metrorrhagia, arising as a result of disease of the genital system, may be traced to the one factor—congestion, and any condition which predisposes to, or causes, congestion will, *ipso facto*, favour the occurrence of menorrhagia. The commonest of these factors is endometritis, while tumours of the uterus or ovaries,

inflammatory conditions of these organs, displacements, placental or decidual remains lying in the uterus, extra-uterine pregnancy, and sub-involution must also be included.

(2) *The Circulatory System.*—All conditions which tend to raise the blood-pressure must be considered as causes of menorrhagia. Amongst these come the earlier stages of heart and renal disease, hepatic cirrhosis, tumours which compress the portal vein or inferior vena cava, emphysema of the lungs, bronchiectasis, and fevers.

(3) *The Nervous System.*—As certain conditions are seen to cause "reflex amenorrhœa," so certain conditions may cause "reflex menorrhagia." The chief of these are too frequent coitus, falls—especially on the breech, too frequent use of hot baths, severe mental emotions, and occasionally perhaps mental disease (Labadie-Lagrave).

DYSMENORRHŒA.

Dysmenorrhœa (δύς, with difficulty; μήν; ῥέω) is the term applied to painful menstruation. In some women, menstruation is always attended by a certain amount of pain, or perhaps it would be better to say by a certain amount of discomfort, and this condition cannot be called dysmenorrhœa. The term must rather be confined to those cases in which menstruation is accompanied by pain sufficiently marked, either owing to its unaccustomed occurrence or to its degree, to be attended by marked nervous or constitutional disturbance.

The causes of dysmenorrhœa, so far as we know them, are as follows:—

(1) Undeveloped conditions of the uterus or ovaries.
(2) Inflammatory lesions of the uterus, ovaries, or tubes.
(3) Displacements of the uterus which involve the presence of a sharp bend in the lower portion of the utero-cervical canal.
(4) Tumours of the uterus, ovaries, or tubes.
(5) Congenital or acquired stenosis of the cervical canal.
(6) Certain more or less obscure nervous conditions—so-called neuralgic dysmenorrhœa.

It is probable that most of these causes act by producing congestion of the uterus or appendages. Such congestion causes an

excessive increase of vascular tension during menstruation, and so produces increased pressure upon the terminal nerve filaments (Fritsch). In those cases in which dysmenorrhœa is not due to congestion, a mechanical cause can generally be found for its occurrence. This mechanical cause takes the form of an obstruction to ovulation, or to the escape of the menstrual fluid. An obstruction to ovulation may be brought about by peri-oöphoritis, in which condition the thickening of the capsule of the ovary prevents the rupture of the Graafian follicle. An obstruction to the escape of the menstrual fluid may be caused by stenosis or atresia of the cervical canal, by tumours or congested endometrium blocking the os internum, and by acute flexions of the uterus.

As MacNaughton-Jones has pointed out, the relation between congestive and obstructive dysmenorrhœa is very close. Congestion of the uterus during menstruation leads to obstruction, and obstruction in its turn leads to congestion. In consequence, it is extremely difficult to say definitely in any case whether congestion or obstruction is the primary cause of the dysmenorrhœa, and, as a rule, if our treatment is to be successful, both factors must be treated.

The existence of such a condition as obstructive dysmenorrhœa is vigorously denied by many writers, on the ground that no case of true obstruction has ever been shown to exist, and many other theories have been brought forward to account for the origin of the pain. The alternative explanation usually offered is that the pain is due to the occurrence of spasmodic contraction of the uterus, which, instead of contracting as in health, slowly and gradually, to expel the menstrual discharge, contracts spasmodically, that is violently, suddenly, and painfully. That such contractions occur is doubtless true, but there must be some definite cause for their occurrence. Herman, who is opposed to the obstruction theory, suggests that in "spasmodic dysmenorrhœa the want of physiological relaxation of the cervix prevents normal, regular, and painless contraction of the body." We confess we do not consider that this explanation is as satisfactory as one which attributes the cause of the spasmodic contraction of the uterus to an effort to overcome an obstruction caused in the manner we have described. It is somewhat significant that the rule in these cases of dysmenorrhœa is to find an

exaggeration of the normal flexion of the uterus or an abnormal narrowing of the cervical canal; and it is equally significant that even those, who oppose the obstruction theory on theoretical grounds, resort, in practice, to measures whose result is to remove obstruction. The dispute which has raged round the true cause of the dysmenorrhœa in these cases has become one of words, and might with profit be abandoned.

In some extremely rare cases the entire mucous membrane of the uterus becomes detached at each menstrual period, and is expelled, causing during the latter process severe dysmenorrhœa. To this condition the term *membranous*, or *exfoliative*, *dysmenorrhœa* has been given. The ætiology of this condition is somewhat obscure. Undoubtedly, many cases, in which casts of the uterus have been expelled, were in reality cases of abortion or of extra-uterine pregnancy, but also well-authenticated cases of true membranous dysmenorrhœa have occurred, in which there was no possibility of the condition being due to either of these causes. De Sinéty, who considered that the menstrual blood comes from the superficial group of capillaries of the endometrium under normal circumstances, believes that in these cases the hæmorrhage comes from the submucous capillaries, and that its escape thence being impeded, it causes a detachment of the mucous membrane. Siredey brings forward another theory, that, owing to certain causes, unduly strong contractions of the uterus occur, as a result of which the entire mucous membrane is thrown off in the same manner that the placenta is detached after delivery. Such a process is, however, scarcely possible unless an excessive degree of hypertrophy of the endometrium had previously occurred.

CHAPTER III.

DISEASES OF THE BLADDER AND URETHRA.

The Bladder: Cystitis; Ætiology, Symptoms, Treatment, Tumours, Displacements, Vesical Fistulæ—The Urethra: Tumours—Prolapse of the Urethral Mucous Membrane.

THE BLADDER.

Cystitis.

Cystitis (*κύστις*, the bladder) is the term applied to inflammation of the mucous membrane of the bladder.

Ætiology.—Cystitis may arise in any of the following ways:—

(1) By infection carried upwards through the urethra. This is very much the most common mode of infection. In cases of pre-existing vaginitis or urethritis, bacteria may be carried into the bladder on catheters or other instruments, or may make their way in by gradual extension of the infection upwards. Also, even when there are no bacteria in the urethra, they can be carried into the bladder by means of dirty instruments.

(2) By infection travelling downwards from the kidneys or ureters. In this case the bacteria may come from an already infected kidney or ureter, or they may be eliminated from the blood by a healthy, or comparatively healthy, kidney.

(3) By infection extending directly from a neighbouring septic area. This extension can occur if the bladder wall becomes involved in the inflammatory changes which take place in the tissues surrounding a septic area, or if an abscess formed in some neighbouring structure bursts into the bladder.

(4) By infection reaching the bladder through the blood.

The mere presence of bacteria in the bladder is probably not sufficient to bring about cystitis, and there must also be some predisposing cause which enables the bacteria to attack the bladder wall. It is probable that we do not know all these causes, but two of them are to be found in any condition which prevents

the complete emptying of the bladder, and in lesions of the epithelium lining the cavity.

The bacteria which are most commonly met with in cystitis are the gonococcus, streptococcus, staphylococcus, *Bacillus coli communis*, and tubercle bacillus.

Symptoms.—In the acute stage, the most prominent symptom is intense irritability of the bladder, as shown by scalding pain, constant inclination to pass water, and extreme tenderness of the bladder and the surrounding parts. There is also some elevation of temperature and general constitutional disturbance. The urine is passed in extremely small quantities, and is very turbid. It contains a varying amount of pus, and consequently some albumen, and in very acute cases there may be a little blood. On microscopical examination, one finds quantities of dead leucocytes, squamous epithelium, a few red blood-corpuscles, and bacteria. As the acute stage passes off, the irritability of the bladder becomes less, and the high temperature and constitutional disturbances disappear. If the chronic stage lasts for a long period, the bladder walls become thickened, a fact which can be determined by bimanual examination. In tuberculous cystitis it is usually possible to discover the tubercle bacillus, if several examinations are made of the sediment obtained by centrifuging the urine.

Treatment.—In the acute stage, interference with the bladder should be avoided, as it probably only increases the congestion. The patient must be kept in bed, and our efforts directed to relieving the pain as far as possible. With this object, hot fomentations should be applied over the abdomen, and copious vaginal douches may be administered. At the same time, morphia may have to be injected hypodermically, if the pain is very severe. Hyoscyamus combined with benzoate of soda—the latter acting as a urinary acidulant—and infusion of buchu, are also of value. Urotropin in doses of from five to fifteen grains administered three times a day is a valuable urinary antiseptic, and is specially useful in cases of cystitis due to the *Bacillus coli communis*.

As soon as the acute stage has passed off, as shown by the diminished frequency of micturition, the bladder may be washed out every second or third day. For this purpose the following solutions are used:—Saturated solution of boracic acid; creolin

solution, at first of a strength of two drachms to the gallon, and gradually increased to double that strength; boro-glyceride (Barff's) about half an ounce to the pint. In cases in which the infection is probably gonorrhœal in origin, very weak formalin solution is useful. Commence with a quarter to a half per cent. solution, and increase the strength gradually up to two per cent. as the patient will bear it. We have found protargol—a silver salt containing eight per cent. of silver, of considerable value in the treatment of cases of cystitis of septic origin. It is used at a strength of from one-half to two per cent.* in aqueous solution, and may be allowed to remain in the bladder for from ten to fifteen minutes or even longer. It causes no pain or discomfort. Very

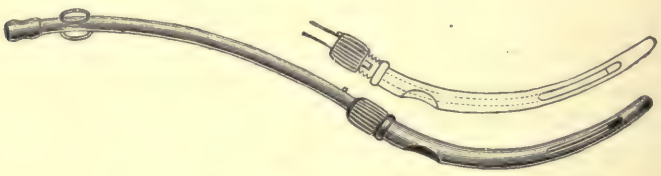


FIG. 11.—Bozemann's return catheter.

weak solutions of nitrate of silver (five grains to the ounce) are also said to be of value.

Irrigation of the bladder is most easily carried out in the following manner. Pour the solution to be used, at a temperature of about 95° F., into an ordinary jug—from which it can be drawn off by means of a syphon douche, or into a glass or metal douche can. After washing the external parts, a medium-sized Bozemann's catheter is fixed to the end of the tube, and passed gently upwards into the bladder. The fluid is allowed to flow, and by closing with the thumb the hole in the

* As it takes some little time to make protargol solution in the correct proportions, it is useful to have a stock solution of it, from which weaker solutions of the required strength can be made. This may be done as follows:—Ten grammes (154 grs.) of protargol are placed in a small mortar and 5 c.cs. (81 minims) of neutral glycerine added, the two being stirred together with a glass rod until a perfectly homogeneous paste is produced. This paste is then diluted with 95 c.cs. (25½ drms.) of cold sterilised water, and shaken up until complete solution is effected. It is then stored in a coloured bottle in a dark place. As required, a quarter per cent. solution is made by adding 2·5 c.cs. (40 minims) of the standardised solution to 97·5 c.cs. (26 drms.) of water; a half per cent. solution by adding 5 c.cs. (81 minims) to 95 c.cs. (25½ drms.); a one per cent. solution by adding 10 c.cs. (162 minims) to 90 c.cs.; and a two per cent. solution by adding 20 c.cs. to 80 c.cs. (*Colombini*).

catheter for the return flow of water the bladder is distended as much as the patient can bear. Then the finger is taken off the opening and the fluid is allowed to escape. By repeating this process four or five times the bladder is emptied of the purulent accumulation which it contained. If a case of presumed cystitis is not relieved by such treatment, the inside of the bladder should be examined with Kelly's or Nitze's cystoscope in order to ascertain the exact condition present. If the interior of the bladder is then found to be healthy, and if there are not foreign bodies present, such as calculi, the ureters should be catheterised and the urine from each collected separately for examination. In this way the existence of unsuspected renal disease will be determined in some cases (*v.* page 337).

Frequent catheterisation of the bladder is liable to cause cystitis, even if the catheter itself is always sterile. This is probably due to the fact that in such cases pyogenic bacteria are to be found in the urethra, from which they cannot be removed by any preliminary disinfection. It is therefore well, in all cases in which frequent catheterisation has to be performed, to wash out the bladder with boric lotion each time the catheter is passed, in order to remove any bacteria which may have been carried up from the urethra before they have had time to do mischief. This washing out can be easily done with a funnel and a rubber tube. The latter is slipped over the end of the catheter as soon as the bladder is empty, the boric lotion is injected, and is then allowed to escape by removing the rubber tube.

For internal use, the following drugs are recommended:— Benzoate of soda and of ammonia, both for their antiseptic effect and with the object of rendering the urine acid; quinine, as a sedative and antiseptic; salol and urotropin, as antiseptics; and salicylate of soda, with the same object. In gonorrhœal cases, oil of sandal-wood and copaiba are of use.

In very chronic cases which have resisted all other methods of treatment, relief is sometimes obtained by making a fistula between the vagina and the base of the bladder. This ensures that the latter is kept empty, and also enables it to rest from its functions of alternately distending and contracting. This artificial vesico-vaginal fistula is allowed to remain open for a time varying from a few weeks to a few months. This line of treatment will undoubtedly tend to cure the cystitis, but it replaces one

pathological condition by another, as the patient has all the trouble and annoyance caused by a vesico-vaginal fistula. Another objection is that when the time comes to close the fistula, it is often found that the bladder has become so contracted that the patient has to pass water very nearly as frequently as when she was suffering from the cystitis.

Tumours of the Bladder.

The benign tumours met with in the bladder are as follows:—Papilloma, fibroma, adenoma, myoma, and dermoid cyst. The malignant tumours are carcinoma and sarcoma. Mixed tumours may also occur owing to the association of benign and malignant tumours. We are indebted to Kelly's well-known work for the following short notes on vesical tumours.

Papillomata vary in size from that of a pea to that of a walnut, or may be even bigger. They may occur at any age, and may be either single or multiple. They frequently occur in association with other tumours. Three varieties have been described—the villous, the pedunculate, and the coronoid. The villous papilloma occurs in the form of slender filaments growing from the surface of the mucous membrane. They usually occur in groups, but may sometimes cover the entire inside of the bladder. The pedunculate papilloma is the most common, and is attached by a pedicle which may be several centimetres in length. The coronoid papilloma has the appearance of a number of crests closely applied to one another and resembling a cock's comb. All three varieties are composed of a framework of connective tissue, which is richly supplied with blood vessels and is covered by the vesical epithelium.

Fibromata are less common than papillomata. They are sometimes sessile, but usually are pedunculated. They are formed by a hyperplasia of connective tissue and are poorly supplied with blood vessels. They not infrequently undergo myxomatous degeneration.

Adenomata are still rarer. They are pedunculated or sessile, and have a smooth or papillary surface. At the present time it is impossible to account for their origin, as there is apparently a total absence of glandular elements in the bladder. Judging from the analogy of vaginal endothelioma, which sometimes assumes an

adenomatous structure, it is possible that the reported cases of adenoma have been in reality cases of endothelioma.

Myomata are also very rare. They arise in the muscular coat of the bladder, and either become pedunculated or remain sessile.

Dermoid cysts, said to have arisen in the bladder, have been recorded. Whether they would not have been more properly described as ovarian tumours which had become adherent to the bladder wall is another matter, but this view is not improbable.

Carcinoma of the bladder occurs both in the squamous and the cylindrical-celled type. It infiltrates the bladder wall and tends to remain localised there for a considerable time. Finally, it extends to the neighbouring organs. The growth is usually multiple, and projects into the interior of the bladder. In some cases it is covered by villous outgrowths, and in others presents a mulberry-like appearance. In still other cases, the growth is of an infiltrating type, and tends to ulcerate.

Sarcoma of the bladder is rare. It is usually multiple and almost invariably sessile, although pedunculated sarcomata have been met with. The tumours tend to infiltrate the surrounding bladder wall and to ulcerate on the surface.

Symptoms.—The first and chief symptom of most bladder tumours is bleeding. Such bleeding may be slight and only sufficient to colour the urine, or it may be considerable or even profuse. Other symptoms are frequent micturition, or, more rarely, retention or incontinence of urine. Pain also sometimes occurs, and is probably due to an associated cystitis.

Diagnosis.—The diagnosis of a bladder tumour may be made by bimanual examination of the thickened bladder wall, or of the tumour itself when the enlargement is sufficient to render it palpable, and by cystoscopy. It is a golden rule in all cases of hæmaturia to cystoscope the bladder, and then, if a bladder origin can be excluded, to examine the secretion of each kidney separately. If a tumour is found, we must take into consideration whether it is single or multiple, its point of origin, its size, colour and shape, the nature of its pedicle if it possesses one, and the presence of any complication such as cystitis. As general points in the diagnosis between benign and malignant tumours, Kelly lays stress upon the fact that a benign papilloma has a small pedicle, and a malignant one a stout pedicle, and further

that tumours clustered about the neck of the bladder may be looked upon as certainly malignant. To complete the diagnosis a small portion of the growth should be removed and examined microscopically.

Treatment.—Tumour of the bladder must be removed whenever possible. We cannot enter here in detail into the different methods by which removal can be effected, and can only refer to the different routes which can be followed.

Small and benign tumours can be removed through a large urethral cystoscope by means of the galvano-cautery loop or the knife. Similar, or slightly larger, tumours can be removed through a vaginal incision, while large tumours must be removed through a supra-pubic incision. Similarly, portions of the bladder wall can be excised either through the vagina or from above the pubis, according to their situation. Lastly, in cases of malignant disease, the entire bladder has been successfully removed.

Displacements of the Bladder.

Displacements of the bladder may be divided into groups almost identical with those into which we shall subsequently divide displacements of the uterus. These groups are as follows:—

(1) Upward displacement.
(2) Downward displacement.
(3) Lateral displacement.
(4) Inversion.

Upward displacement is usually due to the presence of a tumour below the bladder pushing the latter upwards. The commonest instance of such a tumour is a fibro-myoma of the uterus so situated as to involve both the cervical and fundal region (Kelly). Downward displacement, or cystocele, is the result of injuries of the pelvic floor, and of prolapse of the uterus either in association with, or independent of, such injuries. Lateral displacements are due to the presence of tumours in the pelvis, or to unilateral inflammatory masses such as pelvic cellulitis. Inversion of the bladder is a very rare condition, and is due to causes similar to those of uterine inversion (*v.* page 116).

Displacements of the bladder, with the exception of inversion, are *per se* of little importance, unless they cause obstruction or

the ureters or urethra, or difficulty in completely emptying the bladder. Their treatment, save in the case of inversion, consists in the removal of their cause wherever possible, and so will be discussed later when we deal with the different kinds of pelvic tumours, uterine and vaginal displacements, and perinæal lacerations.

Inversion of the bladder always calls for immediate treatment. To replace the inverted bladder the patient is placed in the knee-chest position, and by compression and manipulation the inverted walls are gradually pushed back again through the urethra. If the condition tends to return it will probably be necessary to perform some operation with the view of narrowing the urethra.

Vesical Fistulæ.

Vesical fistulæ will be discussed in the chapter dealing with traumatic diseases of the genital organs (*v.* page 253).

THE URETHRA.

Tumours of the Urethra.

The new growths met with in the urethra are as follows :—

I. Vascular caruncle.
II. Fibroma and Myoma.
III. Carcinoma.
IV. Sarcoma.

I. Vascular Caruncle.—Vascular or urethral caruncle (*caruncula*, dim. of *caro*, flesh) is the term applied to a small growth of a bright red colour, which is found on the posterior aspect of the urethral orifice (*v.* Fig. 163). It is supposed to arise in connection with Skene's ducts—two small depressions situated in the floor of the urethra, and possibly to be the result of infection. It is usually about the size of a pea, and sometimes is pedunculated. Microscopically, it is most frequently found to consist of angeiomatous tissue, and sometimes it resembles an adenoma.

Varieties.—Clinically, two varieties are met with :—painful caruncles, and painless caruncles.

Symptoms.—The painless form gives rise to no symptoms, and is only discovered accidentally in the course of a vaginal examination. The painful form is characterised by burning pain during

micturition, and is extremely tender to the touch. Each form may give rise to slight hæmorrhage.

Treatment.—The painless form does not call for treatment unless it is causing hæmorrhage. The painful form can be removed by means of a V-shaped incision (*v.* page 322), or by the actual or potential cautery.

II. Fibroma and Myoma.—Both these tumours are excessively rare. The former originates in the connective tissue of the urethra, the latter in the muscular tissue. Most, if not all, of the fibromata recorded were pedunculated, whilst in the only case of myoma which is recorded by Howard Kelly the tumour was sessile. Such tumours always call for removal, and, as a rule, this is easy.

III. & IV. Carcinoma and Sarcoma.—Malignant growths of the urethra are also extremely rare. Carcinoma occurs as a primary growth starting in the mucous membrane, or as a secondary peri-urethral growth extending usually from carcinoma of the vulva. So far, only four cases of sarcoma have been described, and all of these affected the external orifice. These growths call for immediate removal unless they have spread so far as to render complete removal impossible.

Prolapse of the Urethral Mucous Membrane.

This somewhat rare condition occurs only in middle-aged and elderly women. In appearance, it somewhat resembles a caruncle. The latter is, however, usually limited to the posterior wall of the urethra, while in prolapse the entire orifice is surrounded by a red puffy ring.

Symptoms.—The principal symptoms, which this condition may cause, are burning pain on micturition, slight hæmorrhage, and tenderness to the touch.

Treatment.—Dissect off the prolapsed ring of mucous membrane, and suture the cut edge of the urethra to the vulvar mucous membrane by a continuous suture of fine silk or catgut (*v.* page 323).

CHAPTER IV.

DISEASES OF THE VULVA AND PERINÆUM.

The Vulva. Vulvitis—Catarrhal Vulvitis—Exudative Vulvitis—Phlegmonous Vulvitis — Herpes — Eczema — Pruritus Vulvæ — Elephantiasis — Kraurosis Vulvæ—Tumours: Benign Neoplasms; Malignant Neoplasms, Carcinoma, Sarcoma—Hæmatoma—Retention Cysts—Herniæ—Hydrocele of the Canal of Nuck—Tuberculosis of the Vulva. The Perinæum.

THE VULVA.

The term vulva, or external genitals, is applied to the following parts:—the mons veneris, the clitoris, the labia majora and minora, and the hymen. The principal pathological conditions which are met with in this region are as follows: —

Vulvitis.
Herpes.
Eczema.
Pruritus vulvæ.
Elephantiasis.
Kraurosis.
Tumours.
Tuberculosis.

VULVITIS.

Vulvitis (*vulva*, the external female genitals) is the term applied to inflammatory conditions of the vulva.

Varieties.—It is an easy matter to distinguish a number of different forms of vulvitis due for the most part to different infecting organisms; it is, however, extremely difficult to make a satisfactory classification on such a basis. We have, therefore, endeavoured here, as also in the case of vaginitis and endometritis, to adhere as closely as possible to a classification based on

the pathological changes present. Accordingly, vulvitis is classified in the following manner :—

I. Catarrhal vulvitis.
II. Exudative vulvitis.
III. Phlegmonous vulvitis.

I. Catarrhal Vulvitis.—Under the head of catarrhal vulvitis are included most of the common varieties of vulvitis.

Pathological Anatomy.—Catarrhal vulvitis in its simplest form consists in the occurrence of a superficial erythema of the skin, accompanied, in proportion to the severity of the case, by a variable amount of epithelial desquamation and serous discharge. This form is usually known as *simple vulvitis*, and, as instances of it, may be mentioned vulvitis due to constant scratching, diabetic urine, or dirt. In a more severe form, as will be described under the head of vaginitis (*v.* page 49), the papillæ of the true skin become affected, as well as the superficial epithelium, and usually there is an infection by pyogenic organisms. The condition is then known as *granular vulvitis*, and is usually a result of septic or gonorrhœal infection. It is frequently associated with vaginitis.

Ætiology.—The causes of catarrhal vulvitis may be roughly divided into those which come from above and those which come from below. In the first class, are included those inflammations or infections which extend downwards from the vagina or uterus, the constant irritation of the parts by irritating discharges coming from above, and the constant wetting of the parts by ammoniacal or diabetic urine. In the second class are included such causes as dirt, constant scratching, masturbation, too frequent coitus, various traumatisms, parasites, and infection by the gonococcus and other septic organisms, or fungi.

Symptoms.—The symptoms of simple catarrhal vulvitis are a sense of heat and burning in the parts, with a varying amount of pain, particularly after passing water, a more or less intense pruritus or itching, slight tumefaction of the parts, and a varying amount of serous, sero-purulent, or purulent discharge.

Gonorrhœal or septic vulvitis may be acute or chronic. In the chronic stage the symptoms are those just described, but usually in a more aggravated form. In the acute stage all these symptoms are more marked, and, in addition, there are the

ordinary constitutional symptoms of septic absorption—rapid pulse, elevation of temperature, furred tongue, and general malaise.

Treatment.—Endeavour to remove the cause as far as possible, whatever it may be. Infection or inflammation higher up in the genital tract must be treated and cured. The consequences of wetting by urine can be avoided by the continued use of a greasy ointment, which prevents the urine from coming into contact with the skin, and by sponging the parts after passing water. In cases due to dirt, strict cleanliness must be enforced. Traumatic causes, such as scratching, masturbation, etc., must be stopped. If the cause is thus removed, the vulvitis can then be relieved and cured by the adoption of extreme cleanliness and the application of any mild ointment, as zinc ointment, ichthyol ointment, or hazeline cream, to the irritated part. If there is no discharge from above, a dusting powder, consisting of a mixture of one part of oxide of zinc, one part of boracic powder, and two parts of starch powder, may be used instead of the ointment. The following prescriptions may also be found of use:—

℞ Zinci Oxidi,
Bismuthi Subcarb., āā ʒss
Acidi Carbolici Liq., ℥ x
Vaselini, ad ʒj
M. Ft. ung.
(*Wilson.*)

℞ Acidi Carbolici, ʒss
Hydrarg. Sulphidi Rubri, grs. viij
Sulphur. Sublim., ʒiij
Ol. Bergamot., ℥ iv
Vaselini, ad ʒij
M. Ft. ung.
(*Lassar.*)

℞ Resorcin, ʒij
Acidi Salicyl., grs. vj
Vaselini, ad ʒj
M. Ft. ung.
(*Ravogli.*)

℞ Zinci Oxidi, ʒij
Calaminæ Pur., ʒiv
Glycerini, ʒij
Aquæ Rosæ, ad ʒviij
M. Ft. lotio.
(*Wilson.*)

In acute gonorrhœal cases, the patient must be kept in bed, and the parts repeatedly bathed with an unirritating antiseptic lotion. Iodoform powder may be dusted between the labia, and, if the condition is complicated by vaginitis, as is nearly always the case, the latter must be also treated.

II. Exudative Vulvitis.—Exudative vulvitis is the term applied to a vulvitis which is characterised by the appearance over the parts of an exudate which is membranous or pseudo-membranous in character. It is identical in ætiology and

character with exudative vaginitis, and rarely occurs except in conjunction with the latter (*v.* page 53).

III. Phlegmonous Vulvitis.—Phlegmonous vulvitis is also of the same nature as phlegmonous vaginitis, and hence it is not necessary to discuss it separately (*v.* page 54). One of the most common examples of it is the condition known as *noma pudendi*, which sometimes occurs, especially in children after acute fevers.

HERPES.

An eruption of vesicles on the external genitals, similar to those found in herpes of other parts, is occasionally met with. The eruption is usually found on the internal surfaces of the labia majora and minora, on the vestibule and the hood of the clitoris, and at the orifice of the urethra. More rarely, it is found on the external surface of the labia majora and on the mons veneris, while in a few instances it has been noticed on the cervix. The vesicles may occur singly or in one or more groups, they vary in size from a pin's head to a hemp-seed and contain clear serum. When they burst, they leave small superficial ulcers behind, which, unless they are infected by gonorrhœal or other organisms, heal rapidly. The diagnosis of herpes is easily made if the vesicles are unruptured; when, however, they are broken and nothing left but groups of small ulcers, it may be difficult at once to distinguish between it and gonorrhœal or syphilitic ulceration. The herpetic ulcer is more superficial, rounder, and smoother at its base than is the syphilitic, while at the same time the discharge from it is less.

Treatment.—In the vesicular stage, all that is required is a mild saline purgative and the application of some cooling lotion or ointment to the herpetic patches. For the latter purpose, lead lotion or lead and opium lotion may be used with advantage. In the ulcerated stage, brushing the ulcers with a five to eight per cent. solution of nitrate of silver, followed by the application of Unguentum Oxidi Zinci, or any similar ointment, will hasten healing.

ECZEMA.

Eczema of the vulva is not an uncommon condition. It involves

the labia and the clitoris, and may spread on to the mucous membrane of the lower part of the vagina, the adjacent skin of the thighs, and backwards over the perinæum to the anus. It may occur, as in other places, in an acute or chronic form—the latter being the more common. As predisposing causes to its occurrence, may be mentioned any irritation which leads to the scratching of the parts, undue friction of the parts by clothes, constant wetting by urine or vaginal discharge, or general want of cleanliness. The direct cause is the invasion of the deeper layers of the skin by the *Staphylococcus pyogenes albus*. In appearance, eczema of the vulva resembles eczema occurring in other places. It is, however, more difficult to obtain a complete cure here than elsewhere, on account of the difficulty of keeping the parts dry.

Treatment.—All causes which tend to produce or to keep up irritation must be removed. For this purpose, vaginal douches may be administered in cases of vaginal discharge, and pathological conditions of the uterus or vagina should be cured. With the same object, tampons soaked in a ten per cent. solution of ichthyol in glycerine may be introduced into the vagina and removed after twenty-four hours. At the same time, a liniment containing carbolic acid (2 or 3 per cent.) or ichthyol (two drachms to the ounce) may be applied to the affected areas with the double object of sterilising the skin and of affording relief from the intense irritation which the eczema causes, or any of the numerous remedies, adopted in eczema of other parts, may be used instead. In eczema of the vulva, as in eczema of other places, it is difficult to arrive at once at the particular liniment or lotion which will afford the best results, and it is necessary to watch closely the effect of whatever form is prescribed, and to change, or to continue, it according to the effect it produces. The following prescriptions may be found of use in different cases:—

Liniments.

℞ Acidi Carbolici, ʒj
Glycerini, ʒij
Alcohol, ℥ij
Aquæ Rosæ, ad ℥iv
M. Ft. linimentum.
(*Ravogli.*)

℞ Ichthyol, ʒij
Olei Amygdalæ Dulcis,
Aquæ Calcis, āā ʒiv
Glycerini, ℥i
Aquæ Rosæ, ad ℥iii
M. Ft. linimentum.
(*Ravogli.*)

Ointments.

℞ Acidi Salicylici, grs. x
Zinci Oxidi,
Pulv. Amyli, āā 3ij
Vaselini, ℥ss
M. Ft. ung.
(*Lassar's paste.*)

℞ Resorcin, grs. x
Zinci Oxidi,
Pulv. Amyli,
Lanolini,
Vaselini, āā 3ij
M. Ft. ung.
(*Ihle's paste.*)

Amongst other drugs which have been found of value, may be mentioned prepared calamine (15 grs. to the ounce of water), subacetate of lead, Liquor Carbonis Detergens (3j to the ounce of water).

PRURITUS VULVÆ.

The term pruritus vulvæ is used in two different senses. It is used to express itching or irritation about the vulva—a symptom of many different conditions, and it is used to express a definite condition of the external genitals in which there is intense itching without any obvious alteration of the skin.

The pathology of the latter condition was studied by Webster, and his researches show that though there is little or no change visible externally, there are extensive changes in the deeper layers of the skin. These changes are of the nature of a slowly progressing fibrosis, which affects principally the nerves and nerve endings of the clitoris and labia minora. The changes in the connective tissue are most marked in the corium under the papillæ, and are of the nature of a subacute inflammation. The cause of these changes is not known, but probably lies in some form of persistent irritation such as results from the continued passage of diabetic urine over the skin. It is also probable that a general neurotic condition is an important predisposing cause. The symptoms are those of intense irritation, which forces the patient to scratch and even to tear the parts. In consequence of the abrasions of the skin that result in this manner, eczema usually follows.

Treatment.—If any obvious cause for the condition can be discovered, it must be removed. Relief of the irritation may be obtained by the use of the ointments and lotions which have been recommended in cases of vulvitis and eczema, especially perhaps by the use of glycerine and ichthyol. Cold applications, such as lead lotion, are sometimes successful, as may also be sitz

baths containing bran, or an alkali such as biborate of soda or carbonate of soda. The following baths are recommended by MacNaughton Jones:—(1) Bran bath:—bran, 2 lbs.; potato starch, ½ lb.; gelatine, 1 lb.; water at 100—105° F., 25—30

FIG. 12.—Pseudo-elephantiasis. The external organs of generation of a woman, showing hyperplasia of the nymphæ and neighbouring parts. (*Roberts.*)

gallons. (2) Alkaline bath:—carbonate of soda, 2 oz.; hyposulphite of soda, 2 oz.; potato starch, 4 oz.; water at 100—105° F., 25—30 gallons.

C. B. Ball has recommended a simple operative procedure in these cases, with the object of separating the nerve endings in the

skin from the nerve trunks. It consists in dissecting up flaps of skin and then replacing them, and will be described later (*v.* page 346). He has had good results from it. Complete excision of the affected areas of skin has also been practised, and sometimes with good results.

ELEPHANTIASIS.

Elephantiasis, as usually found in these countries, consists of a local hyperplasia of the skin and subcutaneous connective tissue, with enlargement of the lymphatics (*v.* Fig. 12). Round the growth are sometimes found ulcers, which may eat away the neighbouring structures. In some cases, the clitoris alone is affected. It is said that, when elephantiasis is met with in these countries, it is almost invariably associated with tertiary syphilis.

Treatment.—Schroeder recommended excision of the affected tissue, beginning posteriorly and removing it piece by piece, the bleeding surfaces left by the removal of each piece being brought into apposition by sutures before removing the next piece, so as to limit as much as possible the hæmorrhage.

KRAUROSIS VULVÆ.

Kraurosis vulvæ (*κραῦρος*, dry ; *vulva*) is the term applied by Breisky to an atrophic condition of the external genitals and perinæum. The skin becomes smooth and shining, small subcutaneous hæmorrhages appear, and finally the parts become very pale, and look as if they had been ironed out. The microscope shows an increase of fibrous tissue, leading to compression of the vessels and nerves. The papillæ of the skin are small, and the sebaceous and sweat glands have disappeared.

Symptoms.—The symptoms may be slight, or may be very well marked. They consist in tenderness and irritability of the parts, causing pain on coitus, and pruritus. As the atrophy of the tissues becomes complete, the symptoms gradually disappear. If pregnancy occurs, very extensive laceration of the diseased structures may take place during parturition.

Treatment.—The treatment of this condition is most unsatisfactory, but sometimes complete removal of the atrophied tissue has been attended by favourable results. Application of the

cautery to the tender spots (the seats of the subcutaneous hæmorrhages) has also been followed by relief.

TUMOURS.

The true tumours, or neoplasms, met with in the region of the vulva may be benign or malignant.

I. Benign Neoplasms.—The benign growths are all of rare occurrence, and need only be enumerated:—

(1) *Lipoma*, growing from the fatty tissue of the mons veneris and of the labia.

(2) *Myxoma*, growing from the labia, or occurring as an extension downwards of a myxoma of the bladder.

(3) *Angeioma*, growing from the blood-vessels. It is a very rare condition.

(4) *Fibroma*, growing generally from the labia majora, but sometimes from the nymphæ or perinæum.

(5) *Papilloma*, growing from any part of the vulva. It is generally multiple, and occurs as the result of irritating discharges coming from above, as in gonorrhœa.

(6) *Neuroma*, growing from the vulvar nerves. Like angeioma it is a very rare condition.

(7) *Enchondroma*, growing from the clitoris, also a very rare condition.

(8) *Adenoma*, growing usually from the labium majus or minus. It is a very rare condition, and so far only three cases have been recorded (Williamson).

II. Malignant Neoplasms.

(1) **Carcinoma.**—Squamous-celled carcinoma may be found on any part of the vulva, and not uncommonly starts in the clitoris. It ulcerates freely, and involves the inguinal glands at an early stage (*v.* Fig. 13). It may be confused with inflamed papillomata, syphilitic ulceration, or lupus. If there is any doubt as to its nature, a small portion should be removed for microscopical examination. Carcinoma starting in the clitoris is usually a papillary, mushroom-shaped growth, ulcerated on the surface.

Cylindrical-celled carcinoma is a very rare condition. If it

occurs, it starts in Bartholin's gland and rapidly invades the neighbouring tissues.

Treatment.—If seen at a sufficiently early stage, the growth and the surrounding tissues should be extirpated freely, and the inguinal glands removed at the same time. If it is too advanced for this, our treatment is directed towards checking the discharge

FIG. 13.—Epithelioma of vulva. C. Ulcerating growth.

as far as possible. This is best done by freely curetting away the growth and then cauterising its base with nitric acid, chloride of zinc, or the actual cautery. If there is much hæmorrhage, it is checked by the application of plugs squeezed out of strong perchloride of iron.

(2) **Sarcoma.**—This is also very rare. When it occurs, it is usually of the melanotic variety and arises from the labium majus.

In addition to the true tumours of the vulva, there are various false tumours or enlargements met with. They are as follows:—

I. Hæmatoma.
II. Retention cysts.
III. Herniæ.
IV. Hydrocele of the canal of Nuck.

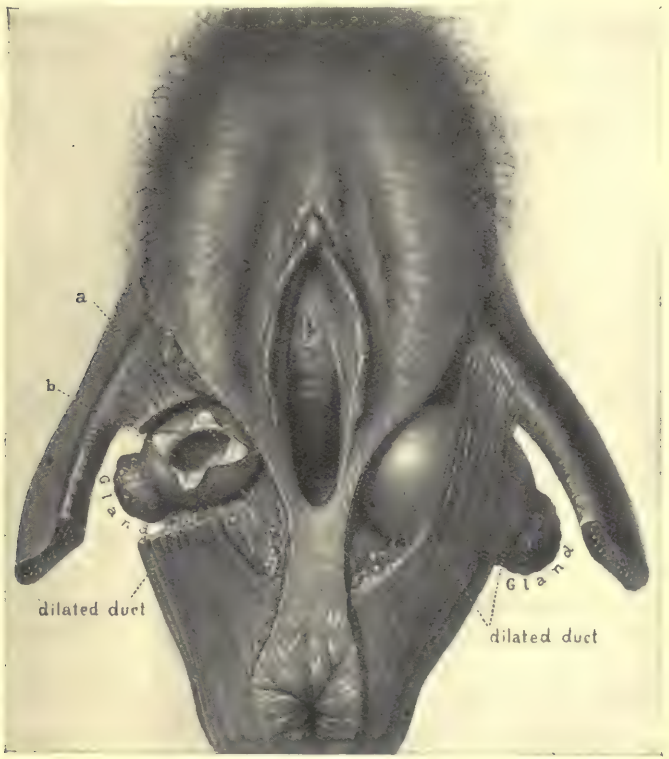


FIG. 14.—Cyst of Bartholin's duct. (*Kelly.*)

I. HÆMATOMA.—Hæmatoma of the vulva is caused by the rupture of a blood-vessel in the connective tissue, which, owing to its laxity, favours the escape of blood amongst its fibres. Hæmatoma most usually occurs as a result of parturition, but may also be due to external violence. It first appears as a small, bluish, and elastic swelling, which gradually increases in size as more blood escapes into it. It may reach an enormous size, or burst, if left untreated.

Treatment.—The patient should remain at rest in bed, and cold compresses be applied to the parts. If the swelling increases in size, it may be necessary to incise it, turn out the clots, and either close the cavity by means of sutures or plug it with iodoform gauze.

II. Retention Cysts.—A retention cyst results from the obliteration of the duct of Bartholin's gland. It may form either in the dilated duct or in the gland itself (*v.* Fig. 14). It is found as an oval and tense swelling varying in size from that of a hazel-nut to that of an egg, and containing a viscid fluid. Mucous and sebaceous retention cysts are also met with. They sometimes attain to the size of a hazel-nut, and, in exceptional cases, may become even larger.

Treatment.—The usual treatment consists in excising the cyst completely, and then bringing together the walls of the cavity so formed by means of sutures passed below it. If the cyst has burrowed so deeply that its removal is dangerous or impossible, it is sometimes sufficient to make a free incision into it, evacuate its contents, and plug it firmly with iodoform gauze. If it is quite small, simple incision is sufficient.

III. Herniæ.—Three forms of hernia are met with in these regions:—

(1) *Inguinal Hernia* (*Hernia Labii Majoris Anterior*).—This is the term applied to herniæ which descend through the inguinal canal. They must be distinguished from hydrocele of the canal of Nuck.

(2) *Labio-vaginal Hernia* (*Hernia Labii Majoris Posterior*).—This descends through the pelvic diaphragm anterior to the broad ligament. It is liable to be mistaken for cysts of Bartholin's gland.

(3) *Perinæal Hernia.*—This also descends through the pelvic diaphragm, but is posterior to the broad ligament.

IV. Hydrocele of the Canal of Nuck.—A hydrocele of the canal of Nuck is the term applied to a collection of fluid in the pouch of peritoneum which follows the round ligament into the labium. It is not a condition of much importance, save that it may be mistaken for an inguinal hernia. It differs from the latter in having no impulse on coughing, and in not being affected

by change of position, whereas an inguinal hernia tends to reduce itself when the patient lies down.

Treatment.—If the fluid is increasing, it may be drawn off with an aspirating needle, under careful asepsis. If the condition recurs, the sac should be exposed and dissected out, and the wound closed with a continuous catgut suture. If there is the smallest doubt as to the nature of the case, we should always cut down upon the swelling instead of aspirating it.

TUBERCULOSIS.

Tuberculosis of the vulva, or lupus, occurs in three forms (Figuet) :—

(1) A superficial form, characterised by the appearance of deep red patches, or of small prominences, varying in size from that of a lentil to that of a shilling. These coalesce and then ulcerate in the centre. The ulcerations extend in a serpiginous manner, and tend to heal at the older end of the track, which they thus form, while the other or younger end is always advancing.

(2) A deep form, in which the ulcerations extend more and more deeply into the tissues rather than superficially.

(3) A hypertrophic form in which there is marked increase in size of the affected parts, especially the labia majora and minora.

Treatment.—Destruction of the growth by the curette and actual or potential cautery, and complete excision with the knife, are the two most suitable forms of treatment. In addition every effort must be made to increase the patient's strength, as in other forms of tuberculous disease, and injections of tuberculin may be given with advantage at suitable intervals.

THE PERINÆUM.

The perinæum is the term applied to the cutaneous and subcutaneous structures lying between the posterior fourchette and the anterior margin of the anus. The only important pathological condition met with here are lacerations the result of labour. Such lacerations may involve only the posterior fourchette, or may extend so far back as to reach, or even involve, the anterior rectal wall. Lacerations extending beyond the

fourchette should always be sutured immediately after delivery. If this is not done, or if after it has been done the torn edges do not unite, the condition known as chronic rupture of the perinæum occurs. This condition, which is frequently the precursor of uterine prolapse, will be discussed in the chapter on genital traumatisms (*v.* page 248).

CHAPTER V.

DISEASES OF THE VAGINA.

Vaginitis—Catarrhal Vaginitis; Pathological Anatomy, Ætiology, Symptoms, Treatment, Complications—Exudative Vaginitis; Symptoms, Treatment—Phlegmonous Vaginitis; Symptoms, Treatment—Emphysematous Vaginitis—Vaginismus; Ætiology, Symptoms, Treatment—Tumours; Benign Neoplasms—Malignant Neoplasms; Carcinoma, Sarcoma, Endothelioma—Vaginal Cysts—Hæmatoma—Tuberculosis—Errors of Development.

THE principal pathological conditions which are met with in, or in relation to, the vagina are as follows:—

Vaginitis.
Vaginismus.
Tumours.
Traumatic lesions.
Tuberculosis.
Congenital malformations of the vagina.

VAGINITIS.

Vaginitis is the term applied to any inflammatory condition of the vaginal mucous membrane or subjacent connective tissue.

Varieties.—The following varieties of vaginitis, classified according to their anatomical peculiarities, are met with:—

I. Catarrhal.
II. Exudative.
III. Phlegmonous.
IV. Emphysematous.

I. CATARRHAL VAGINITIS.—Catarrhal vaginitis is the commonest variety of vaginitis with which we meet.

Pathological Anatomy.—In the earliest stage of catarrhal vaginitis, the papillæ of the vaginal mucous membrane become the seat of a small-celled infiltration. This causes them to increase in size, while the accompanying hyperæmia produces a

more or less marked exfoliation of the epithelium. If only the superficial layers are thus thrown off, the condition is known as *simple vaginitis*. If the inflammation is more severe, the papillæ continue to increase in size, and tend to coalesce, while their epithelial covering is almost or completely destroyed. As a result, the vaginal walls are covered with numerous small projections, which are seen under the microscope to consist of embryonic tissue. To this stage the name *granular vaginitis* is given. A third form of catarrhal vaginitis is met with under the name *senile* or *adhesive vaginitis*. In this form, the enlargement of the papillæ is not so marked as in granular vaginitis, but, on the other hand, the epithelium is thrown off down to its deepest layer. As a result of this complete denudation, the vaginal walls become adherent to one another, and the canal is partially or completely obliterated, or, if only isolated areas become adherent, bands are formed traversing the vagina in various directions.

Accordingly, we see that catarrhal vaginitis is met with under three forms:—

(1) Simple catarrhal vaginitis.
(2) Granular catarrhal vaginitis.
(3) Senile or adhesive catarrhal vaginitis.

Ætiology.—The causes of catarrhal vaginitis fall under two heads:—

(1) Predisposing causes.
(2) Exciting causes.

(1) Under normal circumstances, the vagina is lubricated by a fluid composed of a transudate of lymph-serum and of desquamated epithelial cells. This fluid is acid in reaction, due to the presence of lactic acid, and is found to contain numerous rod-shaped bacilli—the vagina or lactic acid bacillus—and *Monilia candida*, a non-pathogenic fungus which can only develop in the presence of the vagina bacillus. It is thin and opalescent, and is capable of preventing the development of saprophytic or pyogenic organisms. Pathological vaginal discharge on the other hand is alkaline or neutral in reaction, contains no vagina bacilli or monilia, but does contain swarms of saprophytic organisms, staphylococci, streptococci, and sometimes gonococci.

As it has been definitely proved that the normal vaginal discharge possesses powerful antiseptic properties, which properties

are in the main due to the formation of lactic acid by the vagina bacillus, and as in all probability all forms of vaginitis are due to bacterial invasion, the predisposing causes of vaginitis must be looked for under the head of any condition which tends to neutralise or to render alkaline the normal discharge. The vaginal discharge can be made alkaline in three ways:—by the presence of blood; by increased serous transudation from the vaginal walls or uterus; or by the frequent removal of the acid-producing bacilli. The presence of blood in the vagina occurs physiologically during menstruation and the puerperium, pathologically as a result of uterine disease, new growths of the vagina, or traumatisms. Increased serous transudation may arise from some pathological condition of the uterus or adnexa, or from mechanical irritation of the vagina causing congestion of the mucous membrane or stripping of the epithelium. Such an irritation may result from badly fitting or too long worn pessaries, the presence of any foreign bodies, excessive coitus, or frequent vaginal examinations, etc. A gaping condition of the vulva is usually found as a predisposing cause of the mycotic form of simple vaginitis. The frequent removal of the protective bacteria will be brought about by constant vaginal douching.

(2) The direct exciting cause of catarrhal vaginitis is undoubtedly the introduction of bacteria into the vagina. These bacteria may be introduced when any foreign body is passed into the vagina, or may travel upwards by direct extension from an antecedent vulvitis or cystitis, or downwards from an antecedent endometritis. In gonorrhœal infection, which is the commonest cause of the severe forms of catarrhal vaginitis, the cocci in all probability lodge first in the epithelium of the cervix or of the urethra, as the compound squamous vaginal epithelium offers a greater bar to their invasion. They set up there a profuse catarrh, and, when this occurs in the cervix, the discharge pouring into the vagina overcomes the action of the vagina bacilli, washes away the superficial layers of the protecting epithelium, and so permits secondary infection in the deeper layers.

In addition to the gonococcus, the following forms of bacteria are also found as causes of vaginitis:—Various forms of Staphylococcus and Streptococcus, *Bacillus coli communis*, various forms of Diplococcus, and saprophytic bacteria. Various forms of fungi are also met with, which give rise to a form of simple catarrhal

vaginitis known as *mycotic vaginitis*. The chief of these are *Oidium albicans* and *Leptothrix vaginalis*.

Symptoms. — The principal symptoms of simple vaginitis are a feeling of weight and pain in the pelvis, slight serous discharge, tenderness and heat of the genitals, and marked injection and hyperæmia of the mucous membrane. If the condition is due to the implantation of colonies of fungi, the vaginal walls are scattered over with white patches, looking as if flour had been dusted here and there over them. These patches are the colonies of the invading fungus.

In the granular form, the foregoing symptoms are very much more marked. The acute stage is characterised by extreme pain, swelling, and inflammation of the genitals, by profuse purulent discharge, by elevation of the temperature and pulse rate, and by the general symptoms of septic absorption. The symptoms of the chronic stage of granular vaginitis and of senile or adhesive vaginitis are very much akin. In both there is a feeling of weight and pain in the pelvis, accompanied by a burning sensation in the vagina. There is also a more or less profuse discharge, generally purulent in granular vaginitis, sometimes sanious in senile vaginitis.

Treatment.—In the acute stage of gonorrhœal vaginitis, it is often impossible to adopt any local treatment on account of the extreme tenderness. In such cases, all that can be done is to keep the patient at rest in bed, and, if possible, to administer vaginal douches. Such douches should be given at a temperature of about 90° F. and with a low pressure of water. If the patient can bear it, they should contain some unirritating antiseptic, but frequently it is only possible to use plain water. The usual antiseptics are:—creolin (0·3 per cent.), carbolic acid (1 or 2 per cent.), and boracic acid (saturated solution). In addition to douching, pencils of iodoform may be placed in the vagina, also cotton-wool plugs soaked in a 10 per cent. solution of ichthyol in glycerine, or, in septic cases, a tampon of iodoform gauze. Pain can be relieved by hot compresses applied over the lower portion of the abdomen, by hot sitz-baths, and, if necessary, by means of opiates. As the acute stage passes off, the strength of the injections may be increased. Pyroligneous acid, sulphate of copper (20 grs. to the ʒj), nitrate of silver (5 to 10 per cent.), formalin (2 to 12 per cent.), lactic acid (3 per cent.)

(Sneguireff), protargol (2 to 4 per cent.), may be applied through a cylindrical speculum. This speculum should always be the largest size that the patient can bear, in order to distend the vaginal walls as far as possible, and so allow the fluid to come more perfectly into contact with their entire extent. A saturated solution of boracic acid, or a weak solution of boro-glycerine or permanganate of potash, is the most suitable form of antiseptic in mycotic vaginitis.

Complications.—Simple and adhesive vaginitis run a practically uncomplicated course; gonorrhœal vaginitis, on the other hand, is prone to give rise to the most serious complications. Of these, the chief danger is the extension of the infection upwards, first into the uterine cavity, then into the tubes, and lastly into the pelvis, or the general peritoneal cavity. As a result of this extension, gonorrhœal endometritis, salpingitis (either with or without the formation of a pyosalpinx), abscess of the ovaries, pelvic peritonitis, and general peritonitis may occur. As remoter results of this extension, adherent retro-deviations of the uterus, fixed ovaries, tender and shortened posterior ligaments, and sterility from occlusion of the fimbriated extremities of the tubes may also occur. Other complications consist in infection of the bladder or even of the whole urinary tract, infection of the eyes, and the occurrence of gonorrhœal rheumatism.

II. Exudative Vaginitis.—Under this head is included a membranous or pseudo-membranous inflammation of the vaginal mucous membrane. In the membranous form, the mucous membrane is the seat of a true diphtheritic inflammation, occurring as a complication of diphtheria, and usually found in association with diphtheritic vulvitis. In the pseudo-membranous form, the mucous membrane is the seat of a croupous inflammation, a condition which is most frequently met with after parturition as the result of septic infection. It also occurs after various eruptive fevers, as measles, scarlatina, and small-pox.

Symptoms.—In each form, the vagina is covered by a grey membrane, which can be readily detached in the pseudo-membranous form. There is usually extreme tenderness, and a profuse fœtid discharge, high temperature, and the constitutional symptoms of septic or diphtheritic infection.

Treatment.—Frequent vaginal douches containing an unirritating antiseptic should be administered. In the septic form, the application of formalin (2—12 per cent.), followed by the plugging of the vagina twice a day with iodoform gauze, is the best treatment. Iodoform pencils may also be introduced into the vagina, and the head of the patient's bed should be raised in order to facilitate the escape of the discharge.

III. Phlegmonous Vaginitis.—Phlegmonous vaginitis, or paravaginitis, is the term applied to that variety of vaginitis in which the infection has extended into the sub-mucous connective tissue surrounding the vaginal canal. It may be septic or gonorrhœal in origin, or it may occur during the course of infective fevers, enteric fever, and pneumonia.

Symptoms.—The vaginal walls are indurated and perhaps œdematous, and fluctuation may be obtained in places, showing the presence of pus. The constitutional disturbances produced by septic absorption are well marked. The severity of the case depends upon the virulence of the infecting bacterium, and in some cases this may be so great as to cause the death of the patient. Fistulæ may result from extensive sloughing, and in very rare cases, when the inflammation extends all round the vagina, the latter may be detached and thrown off as a slough (Marconnat).

Treatment.—In the early stage, hot antiseptic vaginal douches should be given, and plugs soaked in glycerine and ichthyol may be placed in the vagina. If pus forms, it must be allowed to escape by means of free incisions. The patient's strength must be supported by administering plenty of nourishment, and by the free use of stimulants.

IV. Emphysematous Vaginitis.—This condition was described by Winckel, and named by him *kolpo-hyperplasia cystica.* It consists of the formation of small cysts, containing gas, under the mucous membrane of the vagina. It is a very rare condition, and as a rule only occurs in pregnant women. The cysts are met with in groups, and occur generally on the upper part of the anterior wall of the vagina. They convey a crepitating feel to the fingers, and the mucous membrane round them is somewhat inflamed. The pathology of this condition is obscure. It has been suggested that the cysts are formed from dilated

lymph channels (Chiari), and that the gas is derived from molecular disintegration of the tissues (Pozzi), or from the outer air which gains admittance through minute cracks in the mucous membrane. It is, however, more probable that the gas results from the presence of a gas-producing bacillus (Eisenlohr). There is no special treatment required, as the cysts usually disappear in a short time.

VAGINISMUS.

Vaginismus was first described by Marion Sims, and was defined by him as "an excessive hyperæsthesia of the hymen and vulvar outlet, associated with such spasmodic contraction of the sphincter vaginæ as to prevent coition."

Ætiology.—In the great majority of cases, some local abnormality of the vulvar or vaginal orifice can be found to account for the vaginismus. In a small number, however, no such abnormality can be detected even on the most careful examination. Such cases are usually met with among hysterical patients, and are attributed to some neurotic condition. Amongst the local conditions which are found are vulvis, vaginitis, atresia of the vaginal orifice, inflamed carunculæ myrtiformes, fissures, polypi, prolapse of the ovaries into Douglas' pouch, inflammation of the uterine appendages, cysts or abscesses of Bartholin's gland, and urethral caruncles. A very rare cause, to which attention has been called by Hegar and Kaltenbach, is an unusual degree of obliquity of the vaginal orifice, which brings the clitoris into such a position that it is subject to direct pressure during coitus. Impotence and awkwardness of the husband have also been mentioned as a cause of vaginismus.

Symptoms.—The most marked symptoms are extreme pain during any attempt at coitus (dyspareunia), and such spasmodic contraction of the vaginal muscle as to prevent coitus. On examination, it is sometimes found to be impossible to pass the finger into the vagina, both on account of the pain such an attempt causes and of the spasmodic contraction of the vaginal sphincteric muscles. If the cause of the vaginismus lies in some condition which is situated below the vaginal sphincter, it can usually be easily determined. If, however, it lies above this, an anæsthetic must be administered.

Treatment.—If the cause of the vaginismus can be discovered, and if such cause can be removed, the patient as a rule will be cured. If no cause can be discovered, the treatment is very much more difficult. Vulvitis or vaginitis must be cured. Inflamed carunculæ myrtiformes must be extirpated or destroyed with a cautery. An enlarged Bartholin's gland must be removed. Atresia of the vaginal orifice is best overcome by dilatation with Marion Sims' glass dilators (*v.* Fig. 15), after first incising the constricting tissues round the edge of the hymen. The dilator, which somewhat resembles a large-sized Hegar's dilator, is worn for from three to six hours at a time, and is inserted daily for a period varying from a week to a fortnight. If there is any difficulty in obtaining them, iodoform gauze may be used instead. Sometimes the cause cannot be discovered, and then it is consequently difficult to effect a cure. In purely neurotic conditions,

FIG. 15.—Marion Sims' glass vaginal dilator for use in vaginismus.

sedatives may be tried and complete cessation from marital relations for a time. If this fails, relief may be obtained by the excision of the hymen, even though there is no apparent pathological condition present.

TUMOURS.

The true tumours or neoplasms which are met with in the vagina are as follows:—

I. BENIGN NEOPLASMS.

(1) *Lipoma*, growing from the fatty tissue of the vaginal wall. It is a very rare condition.

(2) *Fibroma and fibro-myoma*, growing from the wall of the urethra and from the upper part of the vagina. These are also exceedingly rare, but sometimes occur as pedunculated or sessile growths.

II. MALIGNANT NEOPLASMS.

(1) **Carcinoma.**—Cancer of the vagina occurs as a primary condition, and as such is extremely rare. It is also found

comparatively commonly as a secondary condition, due to extension of carcinoma of the cervix. Here, we are only concerned with the primary condition.

Pathological Anatomy.—Primary carcinoma of the vagina may start from any part of the vaginal mucous membrane; most frequently, however, it commences either at the vulvo-vaginal junction or at the top of the posterior *cul-de-sac*. If it starts in the former situation, it involves the recto-vaginal septum, then invades the rectal wall, and finally causes a recto-vaginal fistula. If it starts in the latter situation, it rapidly spreads to the vaginal portion of the cervix. Clinically, it tends to assume one of two forms (Pozzi) :—

(*a*) A vegetating or papillary form, which starts as a small papillary projection, grows out in masses resembling the cauliflower excrescences found in cancer of the cervix, and rapidly ulcerates.

(*b*) An infiltrating or nodular form, which starts as a small more or less circular area of infiltration, tends to grow in or beneath the epithelium instead of coming to the surface, and finally sends out papillary projections which ulcerate as in the previous form.

Symptoms.—The symptoms of primary malignant disease of the vagina, as of the cervix, are at first very ill-defined. As a result these cases are rarely seen in time for operation. The patient first notices a blood-stained discharge, which gradually becomes more and more profuse. If the growth is sloughing, there is a profuse sanious discharge, and, if the ulcerative process opens any of the vaginal vessels, there may be serious hæmorrhage. The inguinal glands are early affected.

Treatment.—If the nature of the case is detected in time to afford any hope of a cure, the growth must be excised as widely as possible, and the mucous membrane brought together again by suture, or, if this is impossible, the cavity must be allowed to granulate. If the cervix is involved, it may be sometimes possible to extirpate the tumour by combining abdominal hysterectomy with the complete removal of the vagina, as in the operation described by Werder (*v.* page 442). If the case is inoperable, temporary relief will be given by freely curetting away as much of the growth as possible, and then destroying with the actual cautery, or by the application of strong caustics, the base of the ulcer so formed.

(2) **Sarcoma.**—Sarcoma of the vagina is even rarer than primary cancer.

Pathological Anatomy.—Vaginal sarcoma tends to assume one of two forms :—an infiltrating form in which the growth tends to

FIG. 16.—Infiltrating sarcoma of the vagina.

extend widely over the vaginal mucous membrane, or a circumscribed form in which the growth is more localised or even pedunculated. The latter form is the more common, and arises with slightly greater frequency from the anterior than from the posterior wall. As a rule vaginal sarcomata are spindle-celled, but

round-celled, mixed round and spindle-celled, and giant-celled sarcomata also occur. The case shown in Fig. 16 came under our own care in 1903, and was a round-celled sarcoma of the infiltrating type.

Symptoms.—The symptoms are almost identical with those of carcinoma. The growth spreads rapidly, and usually recurs after removal.

Treatment.—The only treatment is as complete an extirpation as possible. In the case shown in Fig. 16 we removed the lower third of the vagina, and then brought down the mucous membrane of the upper part into contact with the vulvar skin. The patient is in good health, and free from any sign of a recurrence at the present time, *i.e.*, four years after the removal of the growth. The case may therefore be regarded as cured. As a rule, however, total extirpation of the vagina and uterus is indicated in these cases.

(3) **Endothelioma.** — Endothelial tumours derived from the endothelial lining of lymph vessels are sometimes met with in the vagina. We have met with one such case which closely resembled an infiltrating carcinoma. They are extremely rare tumours, and their treatment is identical with that of the other forms of vaginal malignant disease. In our own case we extirpated completely both the uterus and the vagina. The immediate result was satisfactory.

In addition to the true tumours of the vagina various false tumours or enlargements are met with. They are as follows:—

I. Cysts.
II. Hæmatoma.

I. Vaginal Cysts.—Cysts situated beneath the mucous membrane of the vagina and around the orifice of the urethra are frequently met with. They vary in size from that of a hazel-nut to that of a full-term fœtal head, but the smaller sizes are much the more common. As a rule, they are confined to the paravaginal tissue, but sometimes they extend upwards into the broad ligament, and when of large size they may extend so far into the abdomen as to simulate ovarian cysts.

Ætiology.—The ætiology of these cysts is still somewhat

obscure. Five theories as to their causation have been brought forward :—

(1) That they are retention cysts due to the blockage of the duct of a gland (Huguier, Virchow).

(2) That they are due to the dilatation of lymphatic interspaces (Jakesch), in which case they would have an endothelial lining.

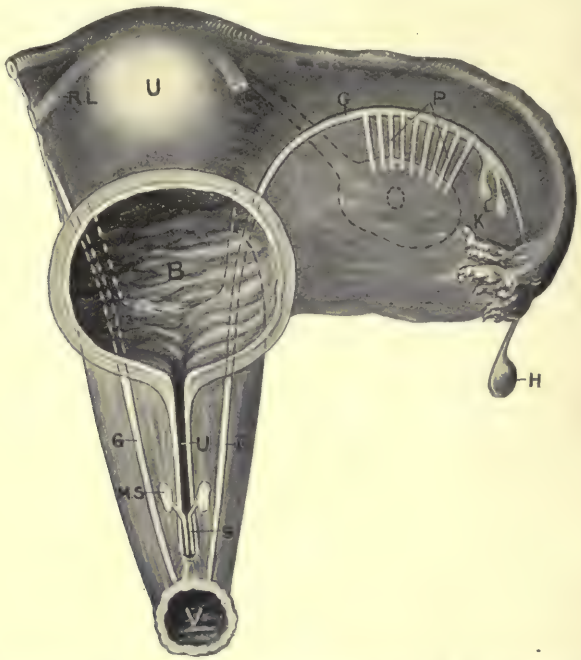


FIG. 17.—Diagram representing the fœtal structures in the broad ligament and vagina in relation to the origin of parovarian and vaginal cysts. U. Uterus. B. Bladder. U. Urethra. S. Skene's ducts. V. Vagina. G. Gärtner's canals. M.S. Max Schüller's glands. K. Kobelt's tubules. O. Ovary. R.L. Round ligament. H. Hydatid of Morgagni. P. Vertical tubes of parovarium.

(3) That they are hygromata (Kaltenbach), that is an accumulation of lymph between the connective-tissue cells, in which case they would have no lining membrane, either endothelial or epithelial. In opposition to both this and the previous theory, is the fact that the cysts are almost invariably lined with cylindrical epithelium.

(4) That the cysts are formed by the dilatation of one or other of two sets of embryonic ducts, which are found in relation to the vaginal wall. These are—the ducts of Gärtner and the ducts of

Skene. The former are the counterpart of the vasa deferentia in the male, and run downwards from the broad ligament beside the vaginal walls, one at each side. The latter open into two small depressions, one at each side of the urethral orifice, and are the counterpart of the prostatic ducts in the male (*v.* Fig. 17).

(5) That the cysts are due to the inclusion of a portion of vaginal mucous membrane amongst the tissues of the perinæum during the healing of a perinæal laceration. According to Kelly, this explanation covers a large number of cases.

It is probable that the last two theories explain the origin of most cases. If vaginal glands exist in the neighbourhood of the fornices, as some writers say they do, there is nothing to prevent retention cysts from forming in them, though it is improbable that such cases are numerous.

In addition to these cysts there is another form met with, namely, cysts due to the implantation of echinococcus colonies. This form, in common with all instances of hydatid infection, is very rare in these countries. We have already referred to gas-containing cysts, the so-called emphysematous vaginitis (*v.* page 54).

Treatment.—The treatment of vaginal cysts resembles the treatment of vulvar cysts. If they are small and are not causing any symptoms they may be left alone, otherwise they should be removed (*v.* page 345). This is done by dissecting out the cyst wall, and then suturing up the resulting cavity. In the case of a large cyst which has extended downwards from the broad ligament, it may be necessary to open the abdomen to render its removal possible. If the cavity cannot be closed by suture after the cyst has been removed, it must be plugged with gauze.

Some writers recommend, in the case of a small cyst, to excise a portion of its wall instead of dissecting out the whole cyst. They claim that this method answers just as well and is safer.

II. Hæmatoma.—Hæmatoma vaginæ may be met with as the result of a trauma occurring during parturition. It is a purely obstetrical complication, and accordingly will not be discussed here.

TRAUMATA OF THE VAGINA.

Traumata of the vagina are so closely associated with those of the perinæum and uterus, that they will be discussed together

(*v.* page 248). Here it is only necessary to mention the fact that they sometimes occur.

TUBERCULOSIS OF THE VAGINA.

Tuberculosis of the vagina is a very rare affection. It is, however, sometimes met with either as a primary condition, or secondary to tuberculous disease of the vulva or uterus. It occurs as an irregular ulcer with sharply cut edges, its base covered by a caseous discharge (Weigerst). A final diagnosis can be made by examining this discharge for tubercle bacilli, or by examining microscopically a portion of the base of the ulcer.

Treatment.—If possible the ulcers should be freely excised. If this cannot be done, they may be destroyed by means of nitric acid or the actual cautery. As in the other forms of genital tuberculosis, the injection of tuberculin is of value.

ERRORS OF DEVELOPMENT OF THE VAGINA.

The following are the principal errors of development which occur in the vagina:—

I. Absence of vagina.
II. Double or bipartite vagina.
III. Unilateral vagina.
IV. Stenosis of the vagina.
V. Atresia of the vagina.

We shall again refer to these conditions in Chapters VI. and XIV.

CHAPTER VI.

DISEASES OF THE UTERUS.

Errors of Development: Congenital Absence of Uterus—Double or Bipartite Uterus, Treatment—Stenosis of the Cervical Canal, Symptoms, Treatment—Congenital Atrophy of the Uterus—Infantile Uterus—Congenital Atresia of the Cervix—Congenital Hypertrophy of the Cervix; Treatment.

THE pathological conditions met with in the uterus will be considered under the following headings:—

Errors of development.
Displacements.
Traumatic lesions.
Inflammatory diseases.
New growths.
Tuberculosis.

ERRORS OF DEVELOPMENT.

Under the heading Errors of Development the following conditions are included:—

I. Absence of (1) uterus, (2) ovaries, (3) uterus and ovaries.
II. The various forms of double or bipartite uterus.
III. Stenosis of (1) external os, (2) internal os, (3) entire cervical canal.
IV. Congenital atrophy of the uterus.
V. Infantile or fœtal uterus.
VI. Congenital atresia of the cervix, or of one side of a double cervix.
VII. Congenital hypertrophy of the cervix.

I. CONGENITAL ABSENCE OF UTERUS, ETC.—Congenital absence of the uterus, or ovaries, alone, or of the uterus and ovaries, is a very rare condition. In some cases, it is accompanied by absence

of the vagina as well. These conditions are only of diagnostic interest, as there is naturally no treatment of any avail.

II. Double or Bipartite Uterus.—The various forms of double or bipartite uterus are not of any great gynæcological interest. They only become of importance under certain circumstances:—

(1) If they cause trouble during pregnancy or parturition.
(2) If there is an atresia of any portion of the cervix or vagina on one or both sides, leading to retention of the menstrual products.
(3) If they give rise to a difficulty in diagnosis.

Treatment.—The only case in which any question of treatment might arise would be in those cases in which there was a retention of the menstrual products. Such cases will be discussed under genital atresiæ (*v.* page 260).

III. Stenosis of the Cervical Canal.—Congenital stenosis (στένος, narrow) of the cervical canal, or of any part of it, is most usually the result of imperfect development of the uterus, and so is associated with acute anteflexion, as the latter condition is sometimes produced by imperfect development of the anterior uterine wall. Acquired stenosis may occur as the result of the improper use of caustics, or after a too extensive trachelorrhaphy, or amputation of the cervix. Although it is not the result of an error of development, we may refer here to its treatment.

If the cervical canal is of its normal size, there should be no difficulty in passing a sound 4 mm. in diameter into the uterus, if the sound is properly directed (Schultze). If this cannot be done, a diagnosis of stenosis of that portion of the canal at which the obstruction is found is made.

Symptoms.—The chief symptoms of stenosis of the cervical canal are dysmenorrhœa and sterility. The dysmenorrhœa is usually worse at the commencement of the period, and becomes less as the flow is established. It is most probably due, as Sims said, to the painful contractions of a uterus endeavouring to overcome the mechanical obstruction to the outflow of the menstrual products. It has been vigorously denied by many writers that stenosis sufficient to cause obstruction ever occurs as a congenital condition, and we have already referred briefly to the obstruction theory of dysmenorrhœa (*v.* page 24). Whether

such a theory is true or not is an unsettled point, but, in our opinion, the balance of evidence is in its favour, and in practice the best results are obtained by acting on the principle that it is true.

Sterility in all probability is caused by the endometritis which almost invariably accompanies stenosis, and also by the stenosis of the os externum preventing eversion of the mucous membrane of the cervix if, as is said, such eversion normally occurs during coitus (Dührssen). As such an eversion, with the subsequent retraction of the mucous membrane, if it occurs, must be an important factor in the introduction of spermatozoa into the cervical and hence into the uterine cavity, it follows that when it does not occur the spermatozoa lie for a longer time than usual exposed to the action of the acid vaginal mucus. This in itself may be sufficient to kill them.

Treatment.—The extent to which the treatment of these cases should be carried is often a matter of dispute. Stenosis of the cervical canal does not in itself endanger life, and therefore there is often a certain amount of reluctance in adopting operative measures, which, although practically safe in competent hands, have theoretically a certain amount of risk attached to them. Then, again, many of these cases occur in young unmarried girls, and consequently there is always a difficulty in making the necessary examination. As a result, in many cases palliative treatment is commenced, and is continued for an unduly long time, with the result that the patient is kept in a condition of semi-invalidism, which may end in making her of a confirmed neurotic disposition; or, what is very much worse, she may be led into the habit of constantly taking sedatives, and so end as a morphia maniac.

The author hopes that this expression of opinion will not be taken to mean that he condemns all palliative measures, as, on the contrary, he recognises the fact that by such means the dysmenorrhœa associated with the stenosis can be completely overcome in some cases. He merely wishes to protest against the ill-advised continuance of palliative treatment in those cases in which only temporary relief is obtained.

Palliative Treatment.—The palliative treatment of stenosis consists in rest in bed during the menstrual period, the application of glycerine plugs to the cervix for a few days before the period

is due, hot douches, sitz baths and the use of sedatives, as bromide of potash, hyoscine, morphia, chloral, etc. If these means fail, not alone to relieve the patient temporarily, but also to prevent the recurrence of the condition, the advisability of adopting operative measures must be considered.

Radical Treatment.—The form of radical treatment which is adopted depends upon the situation of the stenosis. If the latter is situated at the os externum, bilateral division of the cervix (*v.* page 393), or, if the cervix is elongated, amputation of a portion of it by Simon-Marckwald's method (*v.* page 389) is the best operation. If there is stenosis of the entire cervical canal, posterior division as recommended by Marion Sims is the best operation (*v.* page 394). If there is much accompanying anteflexion of the uterus, the modification of Sims' operation which has been suggested by Dudley is more suitable (*v.* page 396). The most difficult cases to treat are those in which there is marked stenosis of the internal os. It is to these cases that dilatation is perhaps the most suited (*v.* page 374), but unfortunately its effects are usually only temporary. If it fails, Dudley's modification of posterior division may give better results.

Acquired stenosis can usually be overcome by dilatation followed by plugging of the uterine and cervical canal with iodoform gauze. If this is not sufficient, posterior division should be performed.

It is always well to remember that, if any form of operative treatment is adopted in these cases, the uterus must be curetted as well, in order to cure the endometritis which is almost always present.

IV. Congenital Atrophy of the Uterus.—In this condition, the uterus preserves its normal shape, but is very much smaller than usual, and its walls are very thin (Dührssen). The condition is found in those severe forms of chlorosis which are associated with congenital smallness of the heart and aorta (Virchow).

The symptoms to which such a condition gives rise are amenorrhœa or scanty menstruation, and sterility. The diagnosis is made by means of a bimanual examination and by measuring the length of the uterus with the sound. Treatment is generally believed to be useless.

V. Infantile Uterus.—In the condition known as infantile or fœtal uterus, the uterus maintains permanently the shape which

it normally possesses up to the time of puberty. That is to say, the cervix is abnormally long and thick, in comparison with the thin-walled and small uterine body. Conical cervix, and stenosis of a part or the whole of the cervical canal, are also frequent concomitants.

Symptoms.—The symptoms which an infantile uterus causes are dysmenorrhœa, scanty menstruation, and sterility. The dysmenorrhœa is usually stated to be due to the compression of nerve filaments by an imperfectly developed uterine muscle and endometrium during menstrual congestion of the uterus. It may also be the result of the stenosis of the cervical canal and of the acute anteflexion of the uterus, both of which are as a rule consequent on imperfect uterine development. Scanty menstruation is the natural result of the deficient blood supply of the uterus, while sterility is in all probability caused by an accompanying imperfect development of the ovaries.

Treatment.—The treatment is directed to overcoming the cervical stenosis, as previously described (*v.* page 65), and to stimulating the uterine body to promote development. The latter may be brought about by frequent hot intra-uterine douches, by plugging the cavity with iodoform gauze, and by faradisation with the negative pole of the battery inside the uterus, but, as a rule, all treatment is unsatisfactory.

VI. Congenital Atresia of the Cervix.—Congenital uterine atresia is a very rare condition. It will be described under "Genital Atresiæ" (*v.* page 260).

VII. Congenital Hypertrophy of the Cervix.—In congenital hypertrophy, the length of the cervix is as a rule principally affected, while its thickness remains comparatively unaltered. Elongation is due to a hyperplasia and hypertrophy of the muscle fibre and connective tissue of the infra-vaginal portion (*v.* Fig. 28), the mucous coat as a rule remaining unaffected. There is usually some degree of stenosis of the canal as well.

In consequence of its elongation, the cervix is pushed out of its normal position by the pressure of the vaginal walls, and comes to lie in the axis of the vagina. As a result of this in some cases the cervical displacement is transmitted to the uterus, and backward displacements of the latter tend to occur. This is an important point to remember in the treatment of backward

displacements of the uterus, as sometimes radical measures such as shortening of the round ligaments will fail to cure the displacement unless they are associated with amputation of the hypertrophied cervix.

Treatment.—Treatment consists in amputation of the hypertrophied portion by Simon-Marckwald's method (*v.* page 389). As a rule, it will suffice to remove some of the overgrowth, as the involution, which follows on this, will cause the remainder to disappear.

CHAPTER VII.

DISEASES OF THE UTERUS (*continued*).

Displacements of the Uterus. Terminology—Normal Position of the Uterus—Table of Displacements—Upward Displacement—Downward Displacements—Backward Displacements; Retroversion and Flexion; Retroposition—Forward Displacements; Anteversion and Flexion; Anteposition—Lateral Displacements of the Uterus: Dextro- or Sinistroversion or Flexion—Torsion—Inversion: Degrees, Varieties—Acute Inversion—Chronic Inversion.

DISPLACEMENTS OF THE UTERUS.

The Terminology of Uterine Displacements.—There are certain terms in common use to describe the various positions of the uterus, and these must be clearly understood. The first two of these are the terms *version* and *flexion* of the uterus. In

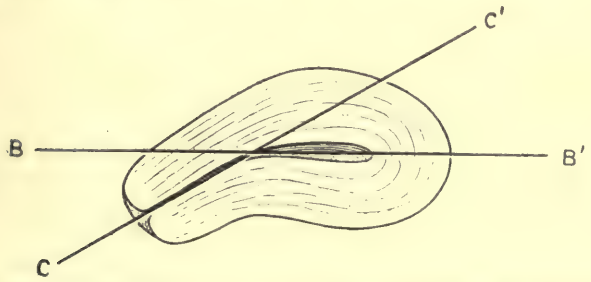


FIG. 18.—Diagram of the uterus showing the axes of the body and cervix. B B' axis of body; C C' axis of cervix.

order to understand these terms the uterus must be considered as consisting of two parts or segments,—a body, and a cervix, each of which is traversed by an imaginary longitudinal axis (*v.* Fig. 18). In consequence of the somewhat lax attachments of the lower segment, *i.e.* the cervix, to the surrounding parts, its axis possesses a considerable range of motion, so that it can move through some 180 degrees in the manner shown in the accompanying diagram (*v.* Fig. 19). Also, as a result of the flexile nature of the uterine tissues at the junction of the two

segments, their respective axes may adopt various relations to one another, and may either coincide or may meet each other at almost any angle. By *version*, is meant the inclination of the

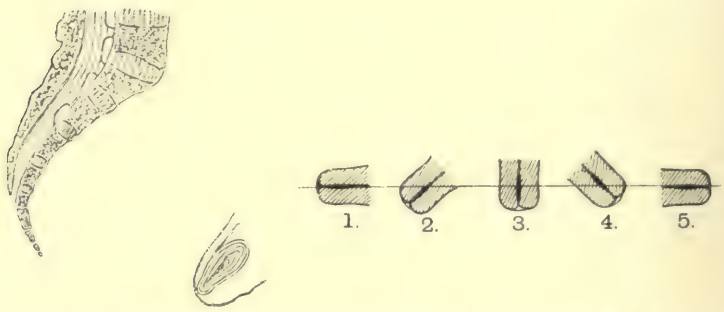


FIG. 19.—Diagram showing the different versions of the cervix in an antero-posterior plane. 1. Complete anteversion. 2. Slight anteversion. 3. Vertical position. 4. Slight retroversion. 5. Complete retroversion.

axis of the lower segment in any direction away from the vertical. If the cervical axis is vertical, version is absent; if it is inclined forwards, the uterus is said to be in a position of anteversion; if backwards, of retroversion; if to the right,

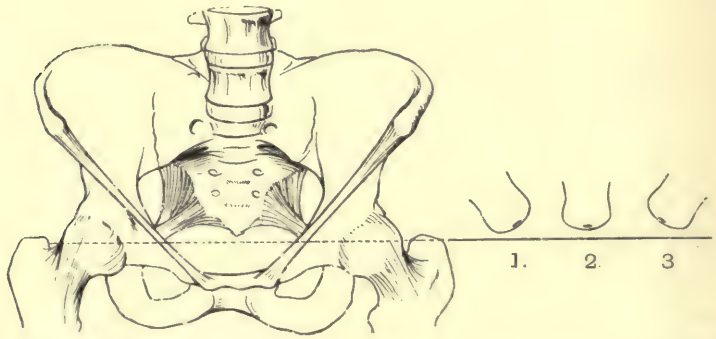


FIG. 20.—Diagram showing the different versions of the cervix in a lateral plane. 1. Dextroversion. 2. Vertical position. 3. Sinistroversion.

of dextroversion; and if to the left, of sinistroversion (*v.* Figs. 19, 20). By *flexion*, is meant a similar inclination of the axis of the upper segment away from the axis of the lower segment in such a manner that the fundus tends to approach the cervix, and the term is again qualified by the same prefixes as is

version—anteflexion, retroflexion, sinistroflexion, and dextroflexion (*v.* Figs. 21, 22). It is not necessary that both flexion and version should occur in the same direction. As will be seen in the diagram, a uterus may be retroverted and anteflexed, or *vice versâ*, or it may be dextroverted and sinistroflexed, or *vice versâ* (*v.* Figs. 21, **10, 11**, and 22, **8, 9**). In such complex displacements, the flexion is considered to be the more important, and in whatever direction it takes place, the uterus is said to be displaced.

The following paragraphs state briefly the terms applied to the various positions which the uterus may assume so far as

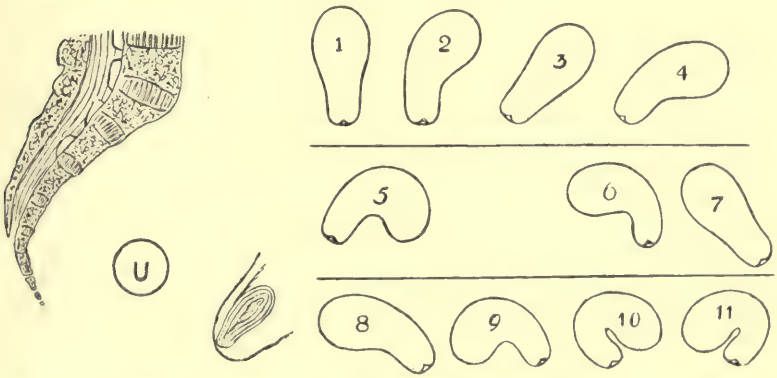


FIG. 21.—Diagram showing the different positions of the uterus in an antero-posterior plane. 1. Vertical position. 2. Slight anteflexion alone. 3. Anteversion alone. 4. Anteversion and slight anteflexion. 5. Anteversion and marked anteflexion. 6. Retroflexion alone. 7. Retroversion alone. 8. Retroversion and slight retroflexion. 9. Retroversion and marked retroflexion. 10. Retroversion and anteflexion. 11. Anteversion and retroflexion.

flexions and versions are concerned, and may be of assistance in enabling the student to understand more clearly these somewhat puzzling terms.

(1) When the axes of the body and of the cervix of the uterus coincide and are vertical, the uterus may be regarded as being neither in a position of version nor of flexion (*v.* Figs. 21, **1**, and 22, **4**).

(2) When the axes of the body and cervix of the uterus coincide, but are inclined away from the vertical, the uterus is said to be ante-, retro-, dextro-, or sinistro-verted according to the direction in which the coincident axes are inclined. As the axes coincide, flexion is absent (*v.* Figs. 21, **3, 7**, and 22, **1, 7**).

(3) When the axis of the cervix is vertical but the axis of the body does not coincide with it, the uterus is said to be ante-, retro-, or latero-flexed according to the direction in which the axis of the body is inclined. As the axis of the cervix is vertical, version is absent (*v.* Figs. 21, **2, 6,** and 22, **3, 5**).

(4) When the axis of the cervix is inclined away from the vertical and the axes of the body and cervix do not coincide, the uterus is said to be ante-, retro-, dextro-, or sinistro-verted and ante-, retro-, dextro-, or sinistro-flexed according to the direction in which both axes are respectively inclined (*v.* Figs. 21, **4, 5, 8, 9, 10, 11,** and 22, **2, 6, 8, 9**).

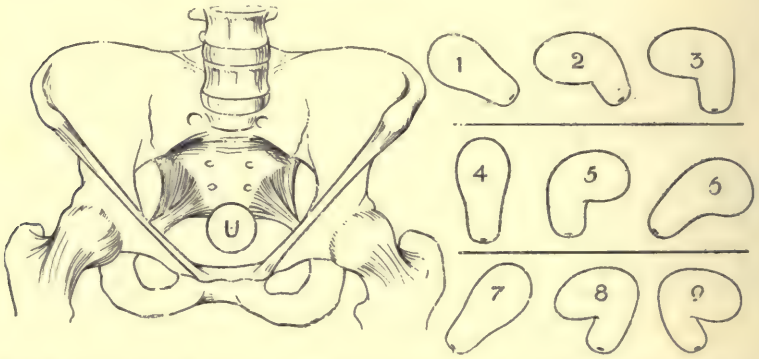


FIG. 22.—Diagram showing the different positions of the uterus in a lateral plane. 1. Dextroversion alone. 2. Dextroversion and dextroflexion. 3. Dextroflexion alone. 4. Vertical position. 5. Sinistroflexion alone. 6. Sinistroversion and sinistroflexion. 7. Sinistroversion alone. 8. Sinistroversion and dextroflexion. 9. Dextroversion and sinistroflexion.

It will be seen that, with the exception of the complex displacements such as associated retroversion and anteflexion, these displacements can be divided into three main groups:—

(1) Backward displacements.
(2) Forward displacements.
(3) Lateral displacements.

In the first group are included retroversion, retroflexion, and associated retroversion and retroflexion. In the second group are included anteversion, anteflexion, and such degrees of associated anteversion and anteflexion as are pathological. In the third group are included dextro- and sinistro-version, dextro- and sinistro-flexion, and associated lateral version and flexion.

Complex displacements are usually of importance on account

of the flexion present, and so may be included, for the sake of convenience, in one or other of these groups according to the direction of the flexion.

If the uterus is displaced *en bloc* in any direction in a horizontal plane, it is spoken of as *-posed*, with the addition of whatever prefix expresses the direction in which it has been displaced,—

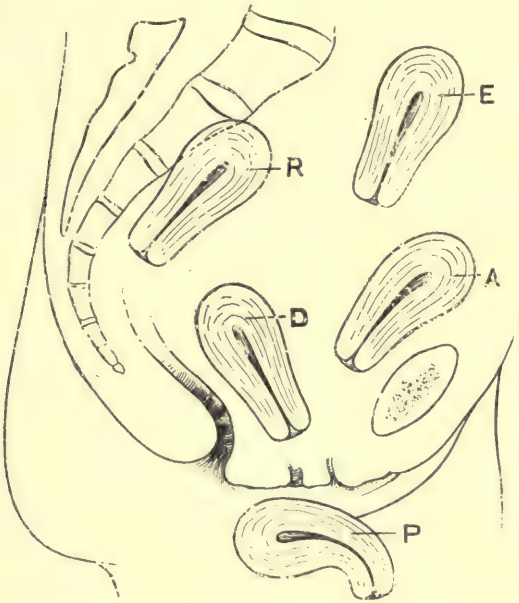


FIG. 23.—Diagram representing some uterine displacements. E. Ascent. A. Anteposition. D. Prolapse. R. Retroposition. P. Procidentia.

anteposed, retroposed, dextroposed, sinistroposed (*v.* Fig. 23, A, R).

If the uterus is displaced in a vertical direction, it is spoken of as *ascent* when it is displaced upwards, *descent* when it is displaced downwards (*v.* Fig. 23, E, D, P). There are two degrees of the latter. Descent of the uterus is known as *prolapse* so long as the uterus does not leave the vagina, it is known as *procidentia* when the uterus is protruding from the vulva (*v.* Fig. 23, D, P).

If the uterus, as a whole, is twisted upon its long axis, either to the right or to the left, the condition is known as *torsion*, with the suitable prefix. Thus we may have dextrotorsion or sinistrotorsion.

If the uterus is turned inside out, so that its mucous lining lies outside of and below the cervix, the condition is known as *inversion* (*v.* Fig. 116).

We may now enumerate in tabular form the various displacements which are met with :—

Upward displacement .	Ascent.
Downward displacement . . .	Prolapse. Procidentia.
Backward displacement	Retro-version, or -flexion. Retroposition.
Forward displacement .	Ante-version, or -flexion. Anteposition.
Lateral displacement .	Dextro- or sinistro-version or -flexion. Dextro- or sinistro-position.
Torsion . . .	Dextro- or sinistro-torsion.
Inversion . . .	Incomplete. Complete.

The Normal Position of the Uterus.—Before commencing to study the abnormal positions of the uterus, it is necessary to understand clearly what is the normal position of this organ. If we understand that the uterus is a mobile organ, and that all its positions—normal or abnormal—are the result of the forces—physiological or pathological as the case may be—which act upon it, and if we discover what the physiological forces are, there will not be any difficulty in determining what are, and what are not, the normal positions of the uterus.

First, what is the normal degree of mobility of the uterus? The relations of the uterus are such that it is enabled to rotate in a sagittal mesial plane following the arc of a circle whose centre is situated about the cervico-vaginal junction. At the same time, the consistence of the fibres of the uterine isthmus is such that the body can bend under the influence of any slight force—such as its own weight—in such a manner that its axis, instead of coinciding with that of the cervix, is inclined to the latter at a varying angle (*v.* Fig. 24).

Secondly, what are the physiological forces which act upon the uterus? The forces which unite to keep the uterus in its normal position are :—

(1) The strain exerted by the uterine ligaments.

(2) The weight of the uterine body.

(3) The intra-abdominal pressure.

(4) The resistance of the pelvic floor and bladder.

(1) *The Strain exerted by the Uterine Ligaments.*—The important ligaments of the uterus are six in number, and are arranged in pairs. The two posterior or utero-sacral ligaments contain muscle-fibres, and run from the lateral aspect of the supra-vaginal portion of the cervix to the sides of the second sacral vertebra. When they contract, they pull the upper part

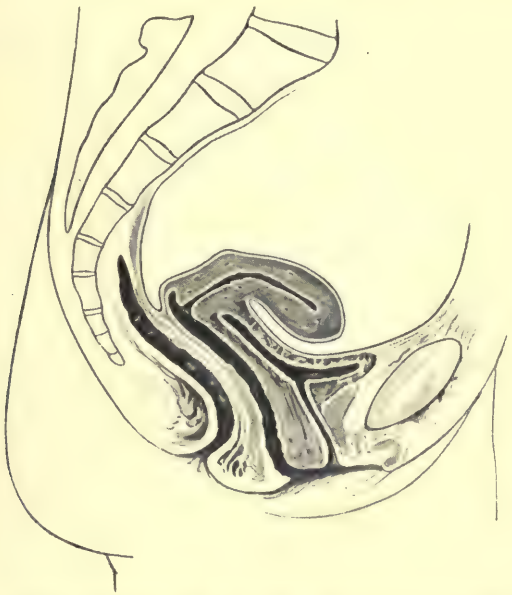


FIG. 24.—Diagram representing the normal position of the uterus in virgins.

of the cervix backwards, and so tend to keep the centre of gravity of the body in front of the cervix, and the uterus in a position of anteversion. They are also an important factor, if not the most important factor, in maintaining the cervix at its normal height in the pelvis. The two round ligaments also contain muscle-fibres. They run from the cornua of the uterus along the face of the broad ligaments to the internal abdominal rings. There they pass from the peritoneal cavity into the inguinal canals, and are finally lost at the external abdominal rings. The effect of their contractions is to pull the fundus forwards. The two broad ligaments pass from the sides of the

uterus laterally outwards to the pelvic walls. They keep the uterus moored in a sagittal mesial plane.

(2) *The Weight of the Uterus.*—The weight of the uterus acting under the influence of gravitation, in conjunction with the flexile nature of the isthmus and with the action of the ligaments, results in producing a slight degree of forward flexion of the body, and marked forward version of the cervix. The flexile nature of the isthmus is greater before pregnancy than after it,

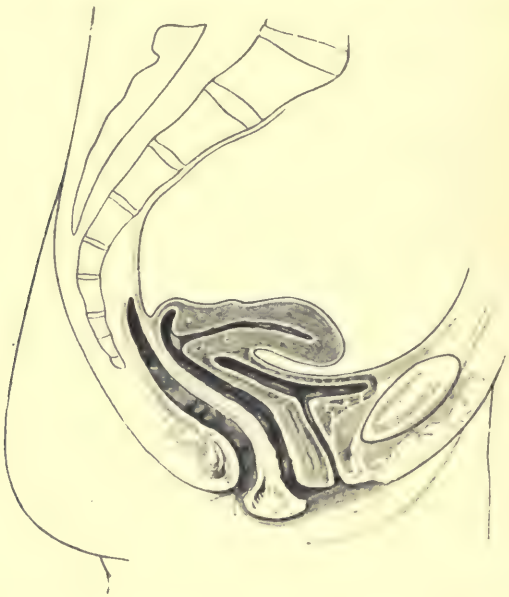


FIG. 25.—Diagram representing the normal position of the uterus in women who have borne children.

and as a result there is a correspondingly greater degree of anteflexion—when the bladder is empty—in virgins than in parous women (*v.* Figs. 24 and 25).

(3) *The Intra-abdominal Pressure.*—The intra-abdominal pressure, acting on the uppermost surface of the uterus, tends to keep the latter in contact with the pelvic floor.

(4) *The Resistance of the Pelvic Floor, etc.*—The resistance of the pelvic floor and bladder is a force, acting upwards, which is sometimes in equilibrium with the downward intra-abdominal pressure. At other times, *i.e.*, when the bladder is distending

or emptying, it is temporarily either greater or less than the intra-abdominal pressure, and so by pushing the uterus upwards, or by allowing it to fall further downwards, it causes a diminution or an increase in the degree of flexion and version present. If the distension of the bladder is very marked, the uterus may be pushed into a vertical position, or even a slight degree of retroversion may occur. If the rectum is also distended, the resistance

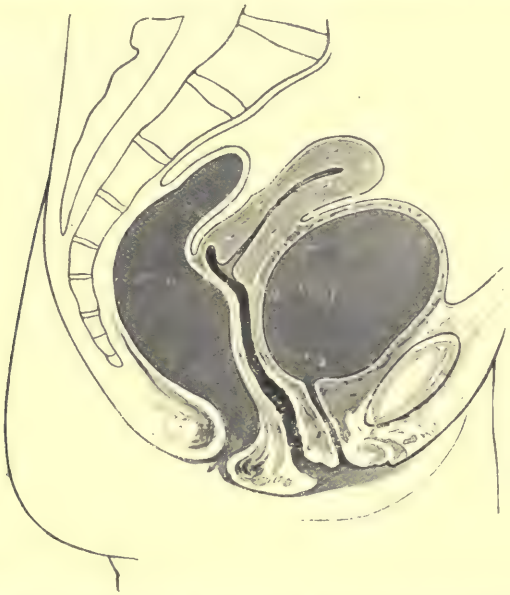


FIG. 26.—Physiological ascent of the uterus, due to distension of bladder and rectum.

of the pelvic floor may be so increased that the uterus is pushed upwards—ascent (*v.* Fig. 26).

The physiological result of all these forces is that the uterus normally lies in a sagittal mesial plane, its anterior surface in contact with the bladder, and the tip of the cervix on a level with the lines joining the ischiatic spines. When the bladder is empty, the cervical axis is almost horizontal, with the fundus in front, and the axis of the body is inclined slightly in front of the cervical axis, so that the fundus rests upon the empty bladder (*v.* Figs. 24 and 25), that is to say the uterus is in a position of marked anteversion and slight anteflexion. When, on the other hand, the bladder is full, the uterus will be found in an almost

vertical position, or, if the former is over-distended, the cervical axis may be even inclined backwards, that is to say the uterus is retroverted.

Accordingly, we see that the uterus has no one normal position, but rather possesses a constantly changing range of positions, owing to frequent alterations in the resistance of the pelvic floor and bladder. So long as the uterus returns to the position it normally occupies when the bladder is empty, as soon as that event occurs, none of these positions can be considered as a pathological displacement. The moment, on the other hand, that the uterus does not return to the position it normally occupies when the bladder is empty, or does not leave that position as the bladder fills, so soon does a pathological displacement or malposition exist.

Speaking in general terms the causes of malposition are to be found in any factors which tend to :—

(1) Diminish, or increase the normal flexibility or mobility of the uterus.

(2) Diminish, increase, or change the direction of the various normal forces which act upon the uterus.

(3) Bring into play other forces which normally are not in existence.

The specific causes, which bring about the various abnormal positions, will be discussed in their proper place.

Upward Displacement.

Ascensus or *Elevatio Uteri* is the term applied to the position of the uterus when it lies at a higher level than normal in the abdominal cavity (*v.* Fig. 23, E).

Ætiology.—Ascent of the uterus may be brought about by :—

(1) Tumours developing below the uterus in such a position as to gradually push it upwards.

(2) Adhesions forming between the uterus and some of the abdominal viscera or parietes.

(3) The operation known as ventral hysteropexy when incorrectly performed (*v.* page 464).

Symptoms.—It is improbable that ascent of the uterus causes any noticeable symptoms, unless it occurs to an unusually marked degree. Any symptoms, which may be present, will be usually found to be due to the condition which is giving rise to the ascent.

Treatment.—As a rule, the cause of the displacement must be treated, and not the displacement itself. If the condition is due to the presence of a tumour, it will be cured by removing the latter. Peritoneal bands will rarely call for any interference on account of their effect upon the uterus, though they may do so on account of their interference with the intestinal functions.

Downward Displacements.

As has been stated already, *prolapse* and *procidentia* are only different degrees of the same condition, *i.e.*, descent of the uterus. In prolapse, none of the uterus has passed the vulvar orifice, while in procidentia, a part or the whole of it has done so (*v.* Figs. 23, D, P, and 27).

Ætiology.—The factors which keep the uterus at its normal level in the pelvic cavity, *i.e.*, with the tip of the cervix on a level with the line joining the spines of the ischia, are :—

(1) The intra-abdominal pressure.

(2) The resistance of the pelvic floor.

The causes of prolapse of the uterus will be found in something which interferes with the normal condition of equilibrium which exists between these two factors. In other words, descent of the uterus occurs usually as the result of increased intra-abdominal pressure, or of diminished resistance of the pelvic floor, or of the two occurring in conjunction. Increased intra-abdominal pressure may be brought about by the presence of tumours, ascites, constant straining, etc. Diminished resistance of the pelvic floor is almost always caused by lacerations which have occurred during parturition, and especially by those which involve the levator ani muscle; also by the relaxation of the vaginal walls and vulva brought about by frequent childbirth. Diminished resistance may also be caused by prolonged standing, particularly in the case of a heavy woman. The manner in which lacerations tend to cause descent of the uterus will be discussed in the chapter on genital traumata (*v.* page 248).

There is one form of uterine descent to which these remarks do not apply, viz., to that form which is known as congenital prolapse. This condition is due to a congenital laxity of the uterine ligaments, and is found in association with laxity of the ligaments which hold the abdominal viscera in place. Thus,

with congenital descent of the uterus, we frequently find associated floating kidney and liver.

Pathological Anatomy.—On examination, the uterus is found either at a lower level than normal in the vagina, or in part or altogether outside the vulva. There is also almost invariably an accompanying protrusion of the anterior vaginal wall, or of the entire vagina. As a rule, the total length of the uterus is increased,

FIG. 27.—Diagram representing complete prolapse (procidentia) of the uterus.

and this increase is usually found to be due to an elongation of the supra-vaginal portion of the cervix. The exact relation of the different parts of the genital canal to one another at any stage in the process of descent depends largely upon the manner in which the prolapse is occurring. As a rule, the latter occurs in one of two ways,—either the uterus prolapses first and in its descent pulls the vagina after it, or the vagina prolapses first and pulls the uterus after it. In the former case, the first step in the prolapse is a backward displacement of the uterus, which as a rule comes

to lie with its long axis more or less closely corresponding with the long axis of the vagina. In consequence, a comparatively small increase in the abdominal pressure or decrease in the resistance of the pelvic floor causes the descent of the uterus through the vaginal slit. As the uterus descends, it inverts the vaginal walls and draws them after it, thus gradually obliterating first the vaginal fornix, and then the upper part of the vagina. Finally, as the uterine body passes through the vulva, the entire vagina becomes inverted.

In the latter case, when the vagina prolapses first, the step in the causation of the prolapse is extensive laceration of the levator ani muscle and of the perinæum. Then the anterior

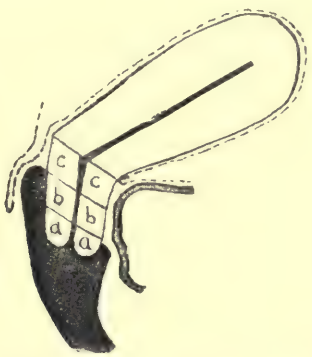


FIG. 28.—Diagram of the three zones of the uterine neck (*Schroeder*). *a a*. Infra-vaginal zone. *b b*. Intermediate zone. *c c*. Supra-vaginal zone.

vaginal wall protrudes in consequence of the loss of the support which it normally receives from this muscle and from the posterior vaginal wall, and drags down a portion of the bladder. As this protrusion becomes more marked the prolapsed wall drags on the anterior wall of the cervix, and, pulling it downwards, causes retroversion of the uterus. Descent of the uterus then commences, and is brought about both by the intra-abdominal pressure acting upon the uterus in its retroverted position, and by the ever increasing traction exerted by the prolapsed anterior vaginal wall. As the uterus descends, it in turn pulls down the posterior vaginal wall with it.

In whichever manner the prolapse occurs, as a rule the anterior vaginal wall drags down the bladder, and the posterior vaginal wall drags down Douglas' pouch. Occasionally, a different result occurs, and the anterior vaginal wall tears itself free from the bladder,

and drags down instead of the latter a diverticulum from the utero-vesical pouch of peritoneum, or the posterior wall may drag down with it a portion of the rectum, and so cause a true "rectocele." If the prolapse of Douglas' pouch, or of the utero-vesical pouch, is very marked, intestines may find their way into the prolapsed peritoneal sac, and cause a vaginal enterocele.

If the ureters are dragged down with the prolapsed uterus, they may become kinked, and an obstruction be thus caused to the flow of urine through them. In consequence, hydronephrosis, and eventually almost complete destruction of the kidney substance, may result.

As a result of inversion of the vagina, the mucous membrane becomes dry from constant friction against the thighs and from interference with its blood-supply. It is also thickened, and comes to resemble ordinary epidermis. There is also usually some ulceration of the mucous membrane of the cervix (*v.* Fig. 114), a condition, which, if the procidentia has been present for some time, extends more or less over the entire inverted vagina.

Symptoms.—The symptoms of prolapse of the uterus are not very well marked, but those of procidentia are more definite. Each condition causes, according to its degree, a sense of weight and dragging in the pelvis, pain running upwards towards the kidneys, frequent and difficult micturition or perhaps even retention of urine, constipation, and various reflex troubles—vomiting, epigastric pain, and dyspepsia. In addition, the endometritis, which very frequently accompanies descent, causes its usual train of symptoms (*v.* page 137). As will be readily understood, the effect of procidentia on the uterine ligaments is very marked. The utero-sacral ligaments in particular become enormously elongated, as upon them the most direct strain falls. The round ligaments and broad ligaments are also considerably stretched. If there is much ulceration of the prolapsed cervix or vagina, there is usually a fœtid and purulent discharge. If the descent is of long standing, and the kidneys have in consequence suffered owing to kinking of the ureters, suppression of urine and its sequelæ may occur at any time.

Treatment.—The treatment of descent falls under three heads:—

(A) Prophylactic treatment.

(B) Palliative treatment.

(C) Radical treatment.

(A) **Prophylactic Treatment.**—Prophylactic treatment consists in preventing the occurrence of, or in removing when they occur, the different factors which may produce prolapse. With this object, perinæal or vaginal lacerations should be sutured at the time they occur, or, if they are not seen then, they should be sutured at a later date; backward displacements of the uterus should be corrected, and the uterus kept in a normal position; and patients with lax ligaments, and a tendency to descent of the pelvic organs, should be advised to avoid prolonged standing.

(B) **Palliative Treatment.** — Palliative treatment consists in replacing the prolapsed uterus, and maintaining it in its position by means of a suitable pessary. The reposition of the uterus is generally easily accomplished if the vaginal walls are not excessively œdematous, as is sometimes the case. With the patient in the dorsal position, the genitals having been well washed, the mass protruding outside the vulva is taken in the hand and pushed gently upwards. Care must be taken to press in such a manner that the vulvar end of the vaginal canal is pushed back first. As soon as the entire mass is reduced, a bimanual examination must be made to determine if there is any retro-deviation of the uterus. If there is, it must be rectified. The means, by which the uterus is kept in position, depend upon whether the vaginal walls and cervix are free from ulceration and œdema or not. If they are healthy, a suitable pessary may be inserted at once, but if they are unhealthy, they must be restored to a normal condition before doing so. The first step is to cleanse the ulcer thoroughly, and to cauterise it by touching it with strong carbolic acid on a piece of cotton wool. Subsequently, daily vaginal douches should be administered, followed by the application of a vaginal tampon of cotton wool soaked in a ten per cent. solution of ichthyol in glycerine, or a mixture of Tr. Benzoin. Co. and glycerine of a strength of a drachm to the ounce. If the patient has to attend to herself, the tampon is tied round with a piece of tape, which hangs outside the vulva, and by pulling on which the plug can be easily removed. As soon as all ulceration of the vaginal mucous membrane is cured, a pessary may be inserted.

There are a few general rules which apply to the mode of using any form of pessary, not alone in prolapse, but

in any displacement in which the use of a pessary is necessary :—

(1) A pessary ought not to be inserted if the mucous membrane of the vagina is unhealthy.

(2) We must be able to pass the tip of the finger round the pessary when *in situ*, between it and the vaginal wall.

(3) Ordinary straining on the part of the patient must not displace the pessary downwards.

(4) The pessary must not cause any pain.

(5) The pessary must maintain the uterus in a normal position,

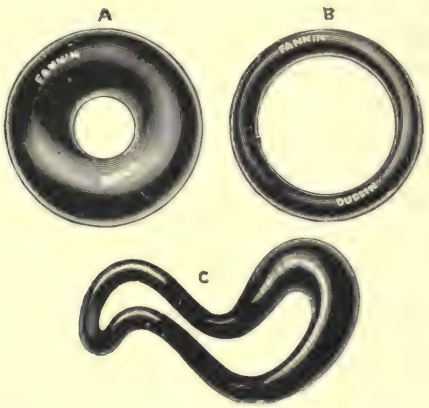


FIG. 29.—Pessaries. A. Hollow vulcanite ring. B. Solid ring of vulcanite or celluloid, representing the first stage in the manufacture of a Hodge pessary. C. Thomas' modification of a Hodge pessary.

otherwise it is of no use ; and it must be the smallest pessary which will do this.

(6) The pessary must not be allowed to remain *in situ* for more than three months at a time, and if there is any tendency to vaginal inflammation, it must be removed at much shorter intervals.

There are four forms of pessary which can be used in these cases :—

(1) A solid vulcanite ring (*v.* Fig. 29, B).

(2) A flexible rubber ring, either solid—Meyer's ring, or containing a watch-spring inside (*v.* Fig. 30).

(3) A hollow vulcanite ring (*v.* Fig. 29, A).

(4) A Hodge, or Smith-Hodge, pessary, as used for retrodeviations (*v.* Fig. 31).

The solid vulcanite ring is the initial stage in the manufacture of the Smith-Hodge pessary. It is made in sizes varying from one and a half inches to four inches in diameter. It is easily inserted, as all that has to be done is to pass it into the vagina after the uterus has been placed in a normal position. It is specially useful when the uterus is atrophied, as in such cases it is not of much importance whether the latter is kept in a position of anteversion or not, so long as it is kept at its proper level.

The flexible rubber or watch-spring pessary is of use in cases in which the vagina is very capacious but the vulvar orifice not very much enlarged, as in such cases it can be more easily introduced than can a rigid pessary. If the uterus is brought into a position of anteversion before inserting the pessary, as should always be done, a rubber ring will frequently keep it so. The

FIG. 30.—Meyer's solid rubber ring.

FIG. 31.—Smith-Hodge vulcanite or celluloid pessary.

disadvantage of this pessary is that it is difficult to keep clean and that the rubber tends to become disorganised.

The hollow vulcanite ring is most useful in cases in which a solid vulcanite ring cannot be retained It is a comfortable form of pessary, as its large surface does not tend to press to an appreciable extent on any particular part of the vaginal wall. If it is used, the patient must be warned, especially if she is old, that it requires to be taken out tolerably frequently. It is often inserted at an age at which the genitals are commencing to shrink, and, if left in too long, it may become incarcerated owing to the contraction of the vulvar orifice, with the result that its removal may be impossible without breaking it up. It also tends to set up vaginitis by preventing the escape of discharge.

A Hodge pessary, or that modification of it known as a Smith-Hodge, is best suited for those cases in which it is essential for

the success of the treatment that the uterus should be kept in a position of anteversion, and in which the perinæum and the levator ani muscle are sufficiently intact to maintain the pessary *in situ*. The manner of inserting it will be described when discussing its use in backward displacements (*v.* page 101). Occasionally, it will not remain in position when inserted in the ordinary manner, but will do so if inserted so that the broad end lies lowest.

There is a fifth form of pessary which is sometimes used, and which it is well to mention, although personally we never use it, namely, a ring or cup-shaped pessary, to which is attached a stem which protrudes through the vulva, and to which tapes are attached. The tapes pass upwards, two in front and two behind, and fasten to a belt in such a manner as to maintain a gentle upward pressure on the stem. Such appliances are sometimes of use in the case of old women, in whom, owing to laxness or absence of the perinæum, a ring pessary cannot be kept in the vagina, but they are objectionable owing to their tendency to cause ulceration and fœtid discharge. The type of these pessaries is that originally described by Barnes. It has lately been modified and improved by, amongst others, Stritch, of Dublin.

Kelly recommends for use in cases of cystocele, in which the vaginal outlet is not unduly relaxed, a pessary designed by Gehrung, of St. Louis. It can be made "by doubling a rectangular Hodge pessary upon itself until the anterior and posterior bars lie parallel and about an inch apart, one a little in advance of the other. In other words, the pessary is bent a little in advance of the centre, and when thus bent it has the shape of two letters U joined at the ends. It must be inserted so that the cervix lies in the open sinus between the rounded ends of the letters (*v.* Fig. 32). The advantage of this pessary is that it keeps constantly tilting, and does not present at the vaginal outlet."

In addition to inserting a properly fitting pessary, we must direct the patient to avoid as far as possible all forms of violent straining. With this object, the bowels must be regulated, any bronchial or laryngeal condition which causes coughing must, if possible, be cured, and occupations which tend to cause sudden or prolonged increase of the intra-abdominal pressure must be avoided.

(c) **Radical Treatment.**—With the modern advance of gynæcological surgery, the radical treatment of descent of the uterus is becoming every day a more generally accepted procedure, and it is becoming more widely recognised that palliative treatment by means of pessaries is unsound in principle and practice, and should be confined to cases in which circumstances prevent the adoption of operative measures. Palliative measures rarely, if ever, effect a cure, but rather tend, each year they are continued, to leave the patient in a worse condition. The large pessaries,

FIG. 32.—Gehrung's pessary *in situ*.

which must be inserted where there is much relaxation of the vulvar orifice, increase the distension of the vagina, and to make up for this a still larger pessary has to be substituted from time to time. The presence of such pessaries maintains a congestion of the parts, and prevents the involution of a large uterus. The longer palliative measures are continued, the more difficult it is subsequently to adopt radical measures successfully. If perinæal lacerations were sutured at the time of their occurrence, or if chronic lacerations were sutured before descent of the vagina took place, prolapse of the vagina would be almost a thing of the past. Radical measures for the cure of prolapse, if properly

carried out, are as a rule successful, and keep the uterus in a proper position without the use of pessaries. Moreover, even if they are not so successful as to enable the patient to dispense with a pessary, they are still of value, since by restoring the levator ani muscle and vaginal outlet, and by reducing the size of the uterus, they enable the latter to be kept in position by a small pessary, which can be worn without either discomfort or bad consequences. In the present state of surgery, it is as foolish to allow a patient to continue with a large prolapse of the uterus as with a large hernia. The actual danger to life may not be so great in the former, as in the latter condition, but the associated discomfort and ill-health are perhaps greater.

The radical treatment of descent of the uterus is directed to the removal or cure of those pathological conditions which have given rise to the descent. Accordingly, all measures of operative interference will fall under one or other of the following heads :—

(1) Measures directed towards the strengthening of the pelvic floor.

(2) Measures directed towards the reduction of excessive intra-abdominal pressure, or of increased size and weight of the uterus.

(3) Measures directed towards the fixing of the uterus in a normal position.

(4) The removal of the uterus.

(1) Operations directed towards the strengthening of the pelvic floor should aim at the removal of redundant vaginal mucous membrane and the repair of the levator ani muscle, if this is torn. These procedures give in most cases very satisfactory results, if they are combined with the necessary measures for keeping the uterus in its proper position. If, however, the patient should again become pregnant and give birth to a full-time child, a second rupture of the muscle may occur, and may cause a return of the condition of vaginal prolapse.

According to the condition of the parts, one or more of the following operations may be necessary :—

(*a*) Anterior colporrhaphy, *i.e.*, removal of redundant mucous membrane from the anterior vaginal wall (*v.* page 367).

(*b*) Perinæorrhaphy, *i.e.*, suture of the torn levator ani muscle and perinæum (*v.* page 347).

(*c*) Colpo-perinæorrhaphy, *i.e.*, removal of redundant mucous membrane from the posterior vaginal wall and perinæorrhaphy (*v.* page 358).

The form of anterior colporrhaphy usually adopted consists in the removal of an oval flap of mucous membrane from the anterior vaginal wall. If a perinæorrhaphy alone is performed, Lawson Tait's is the best operation when there is any actual loss of tissue. When there is an excess of tissue, colpo-perinæorrhaphy is indicated, and in such cases Hegar's operation is perhaps the most suitable. Whichever operation is performed, it should always be associated with suture of the levator ani muscle in the manner which we shall subsequently describe (*v.* page 353).

(2) Measures directed towards the reduction of excessive intra-abdominal pressure include the removal where possible of tumours which may be pressing downwards into the pelvis, and the treatment of the various forms of ascites.

Measures directed towards the reduction of increased size or weight of the uterus include the removal of uterine myomata or of a hypertrophied cervix, and the cure of any other cause of uterine enlargement—as metritis and endometritis. Amputation of the cervix is beneficial not only in cases where the cervix is very much hypertrophied, but also as a means of bringing about involution in a large uterus. The most simple and easily performed method of amputating the vaginal portion of the cervix is that described by Simon Marckwald (*v.* page 389). If, however, there is supra-vaginal hypertrophy of the cervix, it will be necessary to perform supra-vaginal amputation (*v.* page 381). Curetting is another and most valuable means of bringing about involution, and should be the invariable prelude to any operation for the cure of uterine prolapse.

(3) Measures directed towards the fixing of the uterus in a normal position are necessary in cases of prolapse in order to keep the uterus in a horizontal position, and so to prevent it from falling back until its long axis corresponds with the long axis of the vagina (*v.* page 81). They include:—

(*a*) Vaginal hysteropexy (*v.* page 468).

(*b*) Ventral hysteropexy (*v.* page 464).

(*c*) Shortening of the round ligaments (*v.* page 499).

(*d*) Shortening of the utero-sacral ligaments (*v.* page 494).

(*a*) Vaginal hysteropexy, or anterior vaginal fixation, is the

term applied to the operation by which the body of the uterus is brought down between the cervix and the bladder and sutured to the anterior vaginal wall. It is most easily accomplished by the method introduced by Mackenrodt—an operation which can, in many cases, be beneficially and easily combined with anterior colporrhaphy.

(*b*) Ventral hysteropexy is the term applied to the operation by which the uterus is suspended from, or fixed to, the anterior abdominal wall in the middle line (*v.* also page 103). It will give good results in these cases if it is associated with repair of the pelvic floor and with shortening of the utero-sacral ligaments, otherwise the cervix may again prolapse even though the fundus remains fixed to the abdominal wall. If this happens, the uterus becomes vertical and falls into the axis of the vagina. Then, as a result of the traction between the fixed fundus and the prolapsing vagina, the uterine body elongates until the cervix again appears at the vulva.

(*c*) Shortening of the round ligaments does not offer any particular advantages in descent of the uterus, and is open to the same objection as is ventral hysteropexy. Vaginal hysteropexy offers the considerable advantage over each of these operations that it can be easily combined with other vaginal procedures, and does not necessitate a change in the position of the patient during the operation, as is necessary when a vaginal operation is associated with a further abdominal operation.

(*d*) Shortening of the utero-sacral ligaments, on the other hand, is often a most valuable procedure. These ligaments are invariably much stretched in prolapse, and as they perhaps play the most important part in maintaining the normal level of the cervix, it is often advisable to shorten them. This can be done by the abdominal route or by the vagina. Operation by the latter route is the easier, and can be readily associated with vaginal fixation and with high amputation of the cervix (*v.* pages 468 and 381).

(4) Removal of the uterus is recommended under certain circumstances. Vaginal hysterectomy is the method chosen, and the operation is easy owing to the low situation of the uterus. It effectually prevents prolapse of the uterus, but, as usually performed, it perhaps facilitates vaginal prolapse. It is, however, sometimes necessary in cases in which the uterus is enlarged by myomata or chronic metritis. In such cases, great care must be

taken to fasten the utero-sacral and round ligaments to the cut edges of the vagina so as to support the latter from above. It is also usually necessary to perform a plastic operation on the perinæum and the vaginal walls.

Although, in discussing the operative treatment of prolapse, the different proceedings have been considered under four heads, it must not be thought that in treating any case we adopt one of these particular lines of treatment to the exclusion of the others. If the case is one of procidentia, in which the uterus is so large that it is necessary to keep it in a position of anteversion, the procedure which we prefer is as follows:—

(1) Curetting.
(2) Anterior colporrhaphy and vaginal or ventral fixation of the uterus.
(3) Supra-vaginal amputation of the cervix and vaginal shortening of the utero-sacral ligaments.
(4) Colpo-perinæorrhaphy and suture of the levator ani muscle.

In every case the general rule must be followed of first ascertaining the causes of the prolapse, and then adopting those measures which offer the best prospect of removing them.

A few years ago, Stephen Paget suggested a new method of dealing with cases of prolapse in old women in whom a pessary does not keep the uterus in a proper position, and who are too feeble to stand a prolonged plastic operation such as has been just described. This method consists in the submucous injection of paraffin, in a manner similar to that adopted with the object of improving nasal deformity. From one to two ounces of a paraffin with a melting point of 108° F., are injected beneath the mucous membrane of the posterior and lateral vaginal walls and the posterior part of the vaginal portion of the cervix. Doubtless, it would be well to inject some beneath the anterior vaginal wall also in cases of cystocele, if it was possible to do so safely, but Paget does not consider it advisable to bring the paraffin into the neighbourhood of the bladder or urethra. We have had no experience of such a method of treating prolapse, and hence cannot express an opinion either for or against it, but it appears to us that such a procedure should be feasible. In Paget's hands, it has afforded good results.

A somewhat similar procedure—though with a different object—has been introduced by Inglis Parsons, who injects a twenty per cent. solution of sulphate of quinine into the bases of the broad ligaments, with the object of causing an aseptic effusion of lymph and a subsequent formation of fibrous tissue, which, he hopes, will maintain the uterus in a normal position. He has

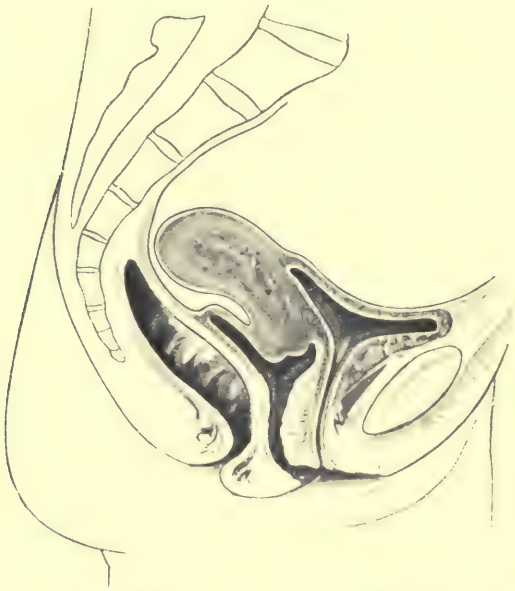


FIG. 33.—Diagram representing a combined retroversion and retroflexion —retroversio-flexio.

had good results from the procedure. We have had no experience of it.

BACKWARD DISPLACEMENTS.

The backward displacements of the uterus are retroversion, retroflexion, and retroposition, or any combination of these. As has been mentioned, slight degrees of these displacements may occur physiologically as the bladder is distending, but in order to constitute a pathological condition they must have a tendency to become permanent.

RETROVERSIONS AND RETROFLEXIONS.—Retroversion and retroflexion are generally associated, for the same reason that anteversion

and anteflexion are associated when the uterus is normal in position. That is to say, if the uterus is either anteverted or retroverted the weight of the uterine body causes the body to flex until the fundus rests on the surface immediately below it (*v.* Figs. 24, 25, and 33). Thus, when the uterus is turned backwards—retroverted—the fundus falls to the bottom of Douglas' pouch, and so a retroflexion is produced in addition.

In rare cases, the uterus may be retroverted alone without any

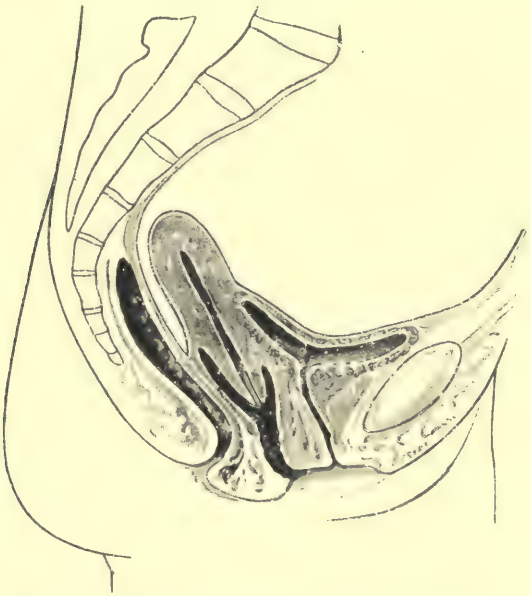


FIG. 34.—Diagram representing a retroverted uterus.

accompanying retroflexion (*v.* Fig. 34). This is only possible under the following conditions :—

(1) If the fundus is held by adhesions in such a manner as to prevent it from falling to the bottom of Douglas' pouch.

(2) If the uterine tissue has become so rigid from disease that the isthmus has lost its normal flexibility (*v.* page 74).

(3) If Douglas' pouch is occupied by a tumour or other mass which prevents the retroflexion of the fundus.

(4) If the uterus is retroposed to such a degree that the body is supported by the sacrum.

It may be taken as a general rule that, though a combined

retroversion and flexion (*retroversio-flexio*) is apparently a greater degree of displacement than a retroversion alone, the latter in the majority of cases is a proof of the presence of a more marked degree of uterine or pelvic trouble than is the former.

Ætiology.—The factors which keep the uterus in its normal position of complete anteversion and slight anteflexion are :—

(1) The utero-sacral ligaments, which draw the cervix backwards, and so keep the centre of gravity of the fundus in front of the cervix.

(2) The round ligaments, which tend to pull the fundus forwards.

(3) The intra-abdominal pressure, which keeps the fundus in contact with the bladder so long as the utero-sacral and the round ligaments are doing their work.

The commonest cause, speaking in general terms, of *retroversio-flexio* is relaxation of the ligaments associated with increase in size of the uterine body. As a result of the increased size, the fundus tends to fall backwards when the bladder becomes distended, and as a result of the laxity of the ligaments, there is no opposing force to prevent it from doing so. Consequently, the body falls away from the bladder, and then the intra-abdominal pressure acts upon the anterior instead of the posterior uterine wall, and so tends to drive the fundus to the bottom of Douglas' pouch. Such a sequence of events is especially liable to occur after labour, and we are strongly of opinion that the great majority of backward displacements, occurring in otherwise normal uteri, date from the puerperium. It is well to state clearly that displacements are apparently just as liable to occur after a normal, as after an abnormal, puerperium, and that a prolonged period of rest in bed after labour does not appear to prevent their occurrence. It is certain that getting up too soon indirectly causes backward displacements, and we are inclined to think that remaining in bed too long may have a very similar effect.

Rarer causes of backward displacement are the adhesions and bands which are the result of peritonitis and parametritis, the traction caused by enlargements of the adnexa, and the pressure exerted by neighbouring tumours.

The specific causes of backward displacement of the uterus are the following :—

(1) Chronic metritis.

(2) Subinvolution.

(3) Small tumours of the uterus.
(4) Congenital laxity of the ligaments.
(5) Congenital mal-development of the uterus.
(6) Pelvic peritonitis.
(7) The drawing forwards of the cervix by cicatricial bands, the result of anterior parametritis.
(8) Enlargements of the tubes or ovaries.
(9) Habitual over-distension of the bladder and rectum.

Symptoms.—The symptoms caused by backward displacements of the uterus are in the main due to the endometritis by which the condition is almost invariably accompanied; to pressure exerted by the retro-deviated uterus upon the sacral nerves, the rectum, the ovaries, and the tubes; and, more rarely, to traction upon, or pressure against, the base of the bladder, and to an accompanying prolapse of the ovaries. As a result, the patient suffers to a very variable extent from menorrhagia and, occasionally, metrorrhagia, leucorrhœal discharges, dysmenorrhœa, pain in the lumbar or ovarian region, perhaps constipation and rectal tenesmus, and, still more rarely, dysuria. If the ovaries are prolapsed below the uterus, dyspareunia may also result. Sterility, or, if the patient becomes pregnant, abortion, is a common occurrence.

Diagnosis.—The diagnosis of a retro-deviation of the uterus is made by means of a bimanual examination, carried out in the ordinary manner. If, owing to the excessive stoutness of the patient, the rigidity of the abdominal walls, or the presence of tumours, it is impossible to determine the position of the uterus in this manner, it will be necessary to resort to the uterine sound. Too much prominence has been given to the use of this instrument, both as a means of diagnosing and as a means of correcting displacements of the uterus. The sound should only be used for these purposes when the bimanual methods of examination and of reposition have failed; and it must not be used even then unless due precautions have been first taken to ensure that it will not be a means of introducing septic matter into the uterus. In order to determine the position of the uterus by this means, the sound is passed gently into the cavity, allowing it to take its own course. The direction in which the point of the sound travels is noted, and also the direction in which the concavity of the sound looks when the latter is in the uterus. In

this way we can determine, first, whether the fundus is in front of or behind the cervix, and, secondly, the direction of flexion of the uterine body.

Treatment.—The treatment of chronic *retroversio-flexio*, as of descent of the uterus, falls under three heads :—

(A) Prophylactic treatment.
(B) Palliative treatment.
(C) Radical treatment.

(A) **Prophylactic Treatment.**—It is only possible to carry out the prophylactic treatment of backward displacements on two occasions, because, so far as we know at present, there is nothing at other times to indicate the necessity for adopting such treatment. These occasions are after labour and after operations on the pelvic organs. It is a very proper and necessary precaution to examine a woman during the third or fourth week after labour in every case, as backward displacements are so prone to occur then, even after a normal puerperium. Moreover, if the displacement is replaced, and is kept in position with a pessary for a few weeks, in the majority of cases the pessary can be then removed, and the uterus will remain in its proper position. On the other hand, if the displacement is allowed to continue, it will probably become chronic. The reason of this is obvious. After delivery all the uterine ligaments are relaxed, and, during the puerperium, they normally return to their usual length. If the uterus falls back, they are at first too long to draw it back to its normal position, and, subsequently, it is probable that they involute only sufficiently to suit the displaced uterus. Consequently, when the latter is brought forward after a long interval, and after involution is complete, the ligaments are then too long to keep it forward, and, involution being complete, it is too late for any further shortening of them to occur. If, on the other hand, the uterus had been brought forward while involution was still unfinished, the ligaments would in all probability have returned to the length proper for them in the case of a normally placed and non-pregnant uterus.

Again, after operations on the pelvic organs, it is well to perform a prophylactic ventral or vaginal suspension of the uterus, if the operation was of such a nature as to predispose to subsequent falling back of the uterus. This is especially the case in operations on the appendages (*v.* page 490).

(B) **Palliative Treatment.**—As a general rule, it is advisable to adopt either palliative or radical treatment in all cases in which a retro-deviation of the uterus is met with. Even if the displacement is not at the moment giving rise to any symptoms, it will most probably do so in the future, and the longer it is allowed to persist the more difficult will the necessary remedial treatment become. Perhaps the only instance in which this rule does not hold good, is when a backward displacement is met with after the menopause, in association with a senile and atrophic uterus.

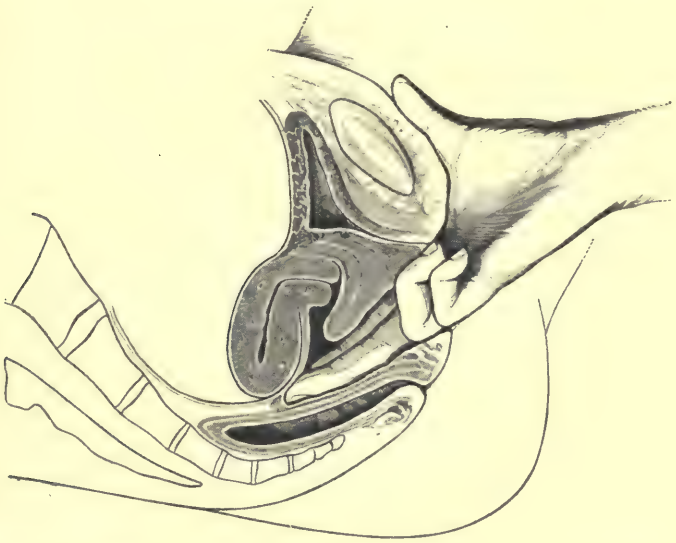


FIG. 35.—Diagram representing the first stage in the manual reposition of a backward displacement of the uterus.

In carrying out either palliative or radical treatment there are two objects to be aimed at:—the maintenance of the uterus in a normal position, and the cure of the accompanying endometritis.

The palliative treatment of retro-deviations consists in replacing the uterus, in keeping it in position by means of a suitable pessary, and at the same time in treating the accompanying endometritis by local applications to the endometrium (*v.* page 141). It is the mode of treatment most usually adopted in these cases, and, although it does not effect a permanent cure in all of them, it does so in some, and hence should be given

a trial whenever possible. It is most likely to yield good results in cases in which the displacement is due to subinvolution or endometritis, and in which, by curing these conditions, we bring about a diminution in the size of the uterus.

The reposition of the uterus is a proceeding which in the large majority of cases is quite simple, but which may be attended with any degree of difficulty or be impossible. Difficulties are caused by rigidity or excessive fatness of the abdominal wall,

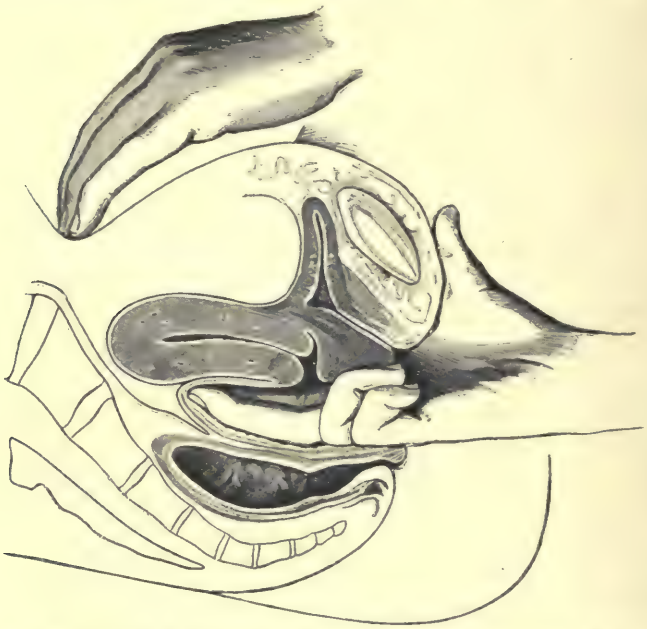


FIG. 36.—Second stage in the reposition of a backward displacement of the uterus.

by the presence of adhesions, by the impaction of the uterus in the pelvic cavity, and by the pain to which attempts at reposition sometimes give rise. In such cases, it is usually necessary to give the patient an anæsthetic in order to replace the uterus satisfactorily.

Reposition should whenever possible be carried out bimanually, and the use of the sound should be avoided unless an accurate diagnosis of the state of affairs present has been made. If there are adhesions holding down the uterus, or if for any reason the uterus does not respond readily to the pressure of the sound, the

latter may easily be pushed through its walls. In many cases, we can replace a uterus bimanually which we could not replace with the sound, and perhaps the only instance in which we can succeed with the sound where the hands have failed, is when the abdominal wall is very rigid or very fat.

The steps in the reposition of a uterus which is not bound down by adhesions, will be most easily understood by reference to the accompanying diagrams. With the patient in the dorsal

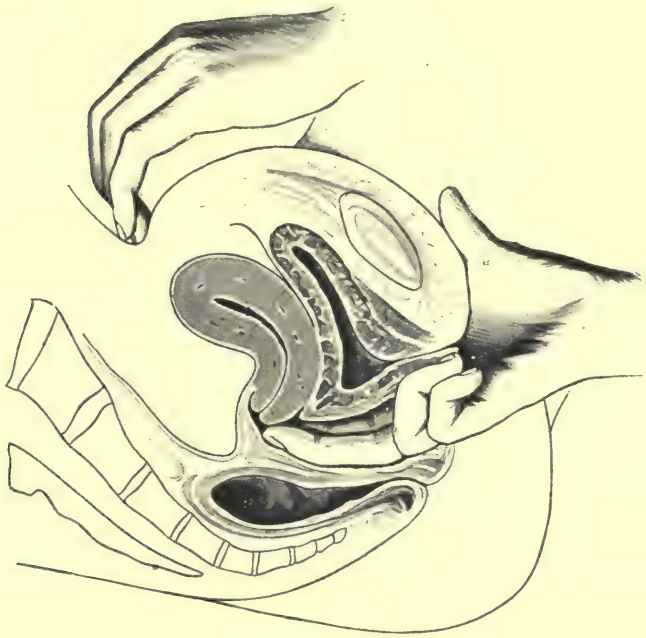


FIG. 37.—Third stage in the reposition of a backward displacement of the uterus.

position, the first step consists in introducing one finger of the right or left hand, as the operator chooses, into the vagina, the other hand lying on the abdominal wall, as if a bimanual examination was being made (*v.* Fig. 2). The fundus of the uterus is felt with the vaginal finger passed into the posterior fornix, and pressure is made upon it in such a direction as to cause it to rise upwards towards the pelvic brim (*r.* Fig. 35). This pressure is continued until the fundus is pushed up as far as the length of the finger will allow (*v.* Fig. 36). Then, the finger is moved from the posterior fornix to the anterior, and backward pressure is

made upon the cervix. This pushes the cervix backwards beneath the fundus, and so enables us to push the latter higher out of the pelvis, by adding to the length of the vaginal finger the thickness of the cervix (*v.* Fig. 37). By this time, the fundus has been brought within the reach of the external hand—which up to this has been doing nothing, and, by depressing the abdominal wall below the umbilicus, we are enabled to get the fingers behind the fundus and to draw it forwards, while with the vaginal finger in

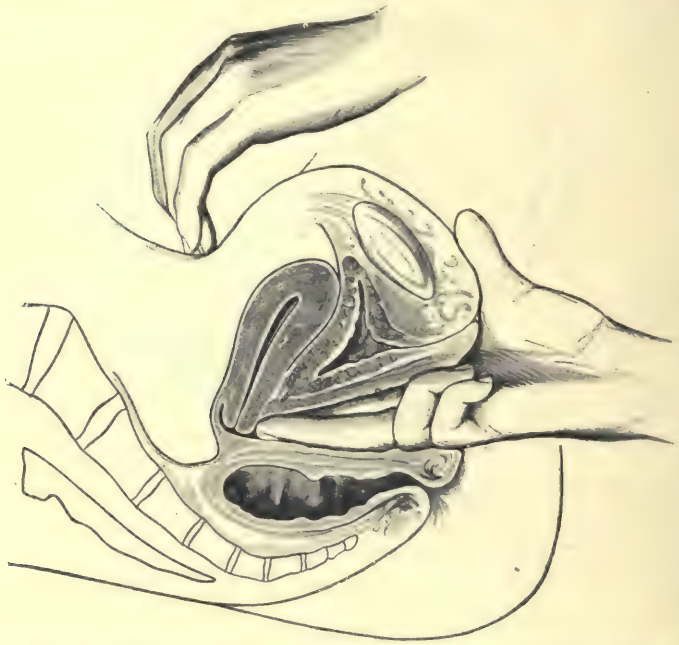


FIG. 38.—Final stage in the reposition of a backward displacement of the uterus.

the anterior fornix we continue to press the cervix backwards. Finally, we are able to palpate the body of the uterus through the anterior fornix and recognise the fact that it is lying in front (*v.* Fig. 38). If one finger is not long enough to replace the uterus, insert both index and middle fingers, as shown in the diagram, a proceeding which adds on about half an inch to the upward reach of the fingers.

In a large number of cases, reposition is greatly facilitated by using in addition to the fingers an American forceps. The anterior lip of the cervix is caught with this, and is drawn

downwards. The uterus follows, and, as it does so, it straightens out, and at the same time the fundus is brought within easy reach of the finger in the posterior fornix. The fundus is then pushed upwards and forwards with the finger, and the cervix is carried upwards and backwards by pushing the forceps gently in the same direction. Lastly, the fundus is drawn forwards with the fingers of the external hand. Another manœuvre by which reposition can be often facilitated consists in passing the middle finger into the rectum and the index finger into the vagina, and pushing up the fundus with the former finger.

If the fundus is bound down by adhesions it will not be possible to correct the displacement without first separating the adhesions. This can occasionally be best accomplished by the manœuvre known as Schultze's (*v.* page 408), to perform which the patient requires to be under an anæsthetic, but in many cases, in order to obtain a permanently satisfactory result, the peritoneal cavity must be opened by the abdominal or the vaginal route, and the adhesions then separated (*v.* page 508).

As soon as the uterus has been replaced, the next question is—What are the best means of keeping it in its proper position? In the majority of cases a pessary of some kind—probably Smith-Hodge—will be found most suitable. If, however, there is any pelvic tenderness, or if the uterus is very soft and congested, there may be some difficulty in finding a pessary which will not cause pain. In such cases, it is best to attempt to keep the uterus in its position by means of vaginal tampons, composed of cotton wool soaked in glycerine, or preferably ichthyol-glycerine, as the latter has more effect in relieving the congestion. These plugs should be changed, if possible every day, if not, certainly every second day, and their use should be continued until congestion and tenderness have disappeared. A pessary may be then inserted.

The same rules apply to the insertion of a pessary in cases of retro-deviations of the uterus as in cases of prolapse (*v.* page 83). The form of instrument which is usually found to be most suitable is a Hodge, or that modification of it known as Smith-Hodge. This pessary is usually made in vulcanite, but the celluloid form is preferable, as its shape can be more easily changed in order to adapt it to any particular case. Both these pessaries keep the uterus in a position of anteversion by pushing

up the posterior vaginal fornix, and so drawing the cervix further backwards. The uterus must be in its normal position before the pessary is inserted. The latter is then held in the fingers of the right hand, while the fingers of the left hand separate the labia. It is pushed gently upwards through the vulva, its larger end first and its transverse diameters corresponding to the antero-posterior diameter of the vulva. As soon as the larger end of the pessary has passed into the vagina, the index finger of the right hand is slipped up behind the pessary and by pressure on its upper end guides it over the cervix. At the same

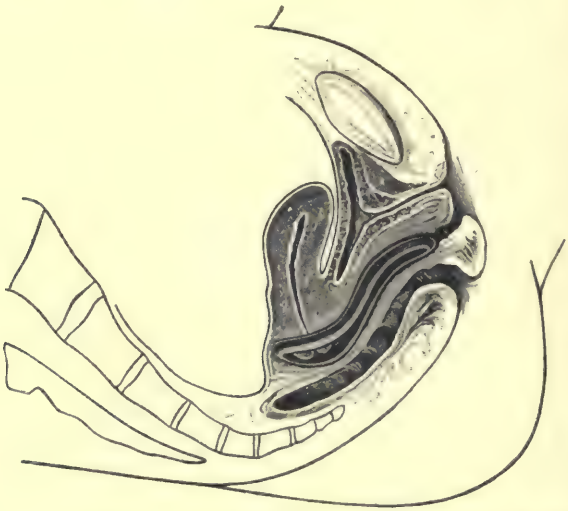


FIG. 39.—Diagram representing a Smith-Hodge pessary *in situ*.

time, the whole pessary is gently rotated until its transverse diameters correspond with the transverse diameters of the vagina, so that it now lies with its larger end in the posterior fornix, *i.e.* above and behind the cervix, and with its greater concavity forwards (*v.* Fig. 39). Care must be taken that the narrow end which is lowest does not press to an injurious extent upon the urethra.

A pessary must not be left in the vagina for longer than three months, without removing it for cleansing purposes. If the vaginal discharge is purulent or very profuse, the patient should use a vaginal douche daily, or every second day. Occasionally, a hard vulcanite ring pessary, or that form known as Thomas'

pessary (*v.* Fig. 29, B, C), will be found more suitable than the Smith-Hodge.

(c) **Radical Treatment.**—The radical treatment of retro-deviations includes those operations by which the uterus is moored in a position of anteversion, or anteversion and anteflexion. Such operations are divisible into two groups :—

(1) Operations directed to the permanent fixation of the body of the uterus in a forward position.

(2) Operations directed to the shortening of the ligaments which aid in keeping the uterus in a forward position.

(1) In the first group come the operations which are known as hysteropexies. They can be carried out by the abdominal or the vaginal route. Vaginal hysteropexy consists in suturing the uterus to the anterior vaginal wall after first separating the bladder and pushing it upwards out of the way. It can be performed by several methods, of which perhaps the best and most easily carried out is that described by Mackenrodt (*v.* page 468). Ventral hysteropexy consists in opening the abdomen in the middle line and suturing the uterus, either to the abdominal fascia or recti muscles (ventral fixation), or to the abdominal peritoneum (ventral suspension) (*v.* page 464).

The objections urged against both these operations are that they bring the uterus from one malposition into another, *i.e.*, from a position of *retroversio-flexio* into a position of excessive anteflexion in the case of vaginal fixation, or into a position of ascent and anteposition in the case of ventral fixation; that they fix the uterus in a single position, whereas the normal condition of the uterus is one of great freedom of movement; and that this obstacle to free movement may interfere with the proper development of the uterus and the progress of parturition if the patient should become pregnant.

These objections undoubtedly apply to all *fixation* operations, but they do not apply to *suspension* operations, and for this reason a clear distinction must be drawn between the two. The object of a fixation operation is to obtain a firm and comparatively unyielding union between the uterus and either the vaginal or the abdominal wall, as the case may be. The object of a suspension operation is to create an elastic and comparatively weak union between the uterus and the peritoneum. This union gradually becomes drawn out into an artificial ligament, which, by its length,

permits the fundus to have a slight, but sufficient, range of antero-posterior movement. If pregnancy occurs, and the uterus rises out of the pelvis, it is probable that in all cases the union ruptures.

Fixation operations are only permissible when the patient is past the child-bearing period, and then they are of considerable value in bringing about a radical cure in cases of prolapse associated with backward displacement. Suspension operations, of which the most important and best is that devised by Howard Kelly, are not associated with any ill consequences during pregnancy, and hence are always permissible. They are not, however, always of value in cases of prolapse of the uterus, on account of the very fact that they bring about an elastic union, and that this may become so stretched as to allow the prolapse to recur. Moreover, they are open to the objection that, if pregnancy occurs, the bond of union between the uterus and the peritoneum almost always ruptures, and that, consequently, after delivery there is nothing to prevent a backward displacement recurring, unless the uterine ligaments have regained their normal tone and have involuted sufficiently to discharge again their proper function.

It is right to say that some operators do not share these views, but believe that if ventral suspension is properly performed, the peritoneal union will elongate during pregnancy, and again shorten after delivery sufficiently to exert a controlling effect upon the fundus. Our own experience is opposed to this belief, and Kelly, the originator of the operation, says that out of fourteen cases in which pregnancy occurred after operation, the displacement recurred in five. For this reason, when the operation is performed in patients who are likely to become pregnant, it should be associated, we think, with one or other of the operations on the uterine ligaments described in the next paragraph.

(2) The principal operations in the second group, which we need consider, are those directed towards the shortening of the round ligaments. Operations for the shortening of the utero-sacral ligaments are also sometimes performed, but they are perhaps of more value in cases of prolapse than of backward displacement. Shortening of the utero-sacral ligaments is also more easily performed by the vaginal route, and so is not so easily combined with an abdominal operation.

The round ligaments may be shortened either extra- or intra-peritoneally. In the extra-peritoneal method described by

Alexander, they are shortened close to their termination at the external abdominal ring (*v.* page 499).

The intra-peritoneal operation consists in shortening the round ligaments on the anterior surface of the broad ligaments, either by the abdominal route or by the vaginal route (*v.* page 503). The advantages, which shortening of the round ligaments possesses over ventro-suspension, are :—that the uterus is brought into a more normal position ; that it possesses a more normal range of motion ; and that, if Alexander's method is adopted, the operation can be performed without opening the peritoneal cavity.

We may now sum up in a few words the relative positions of these various operations as methods of treating any case in which it is decided to adopt radical treatment. Vaginal fixation or ventral fixation is most suitable in cases of prolapse associated with backward displacements. Ventral suspension, *plus* intra-peritoneal shortening of the round ligaments, is most suitable in cases of backward displacement in which the ligaments are stretched, and in which the abdominal cavity has to be opened for any other reason. If the ligaments are not stretched, a simple ventral suspension is probably sufficient. Extra-peritoneal shortening of the round ligaments is most suitable for cases of simple backward displacement, uncomplicated by adhesions or disease of the appendages.

The necessity for any form of radical treatment of backward displacement of the uterus is a subject on which there is much difference of opinion. Many operators think that the operation required is more serious than the condition which it is called upon to relieve. As, however, there are undoubtedly many patients whom a radical operation has been the means of saving from a condition of chronic invalidism, it may not be out of place to attempt to lay down a few rules to guide one in the adoption of palliative or of radical treatment.

(1) Palliative treatment is indicated in all cases at first, as it may bring about the cure of the condition, or the patient may be able to wear a pessary continuously without either discomfort or injury.

(2) Radical treatment is indicated :—

(*a*) When the presence of adhesions between the uterus and the surrounding parts prevents the uterus from being brought into a normal position.

(*b*) When a pessary cannot be found which will keep the uterus in a normal position.

(*c*) When the wearing of a pessary causes continual discomfort, or vaginitis.

(*d*) When the patient lives under circumstances which preclude her from periodically obtaining the necessary medical advice.

Retroposition.—Retroposition of the uterus is the result of tumours so situated in front of the uterus as to drive the latter

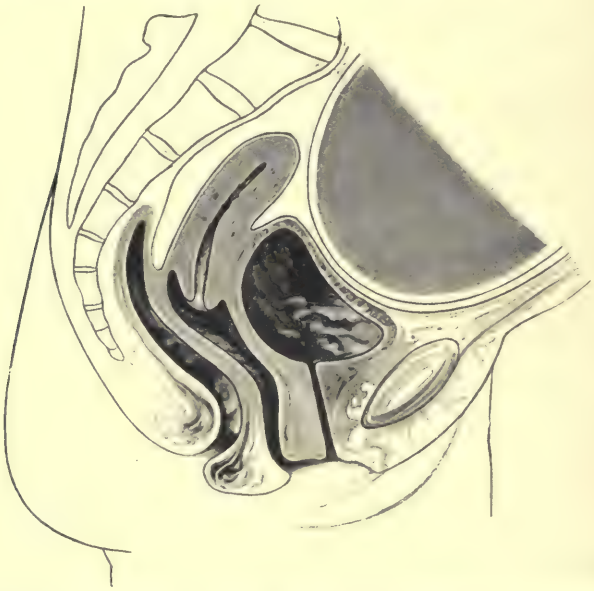


Fig. 40.—Retroposition of the uterus due to the presence of a distended bladder and an abdominal tumour.

backwards (*v.* Fig. 40), and of adhesions or cicatricial contractions of the posterior ligaments pulling it back.

Treatment.—Retroposition of the uterus, when due to the pressure of tumours, etc., can only be cured by the removal of the latter. When due to adhesions or to shortening of the utero-sacral ligaments, it may be relieved by the stretching of such adhesions, but in many cases abdominal section, and separation of the adhesions, will be necessary. This class of case will be more suitably discussed under the head of pelvic peritonitis.

Forward Displacements.

Forward displacements of the uterus include some degrees of anteflexion and anteversion, and anteposition. A marked degree of anteversion of the uterus and a slight degree of anteflexion are, of course, the normal position.

Anteversion and Flexion.—There is considerable difficulty in deciding where to draw the line between the normal

Fig. 41.—Pathological anteversion of the uterus due to dragging backwards of the entire cervix.

anteversion and anteflexion of the uterus, and what is known as pathological anteversion and anteflexion. Schultze suggests that "anteversion and anteflexion are pathological when they are stable, that is when the normal movements of the uterus out of these positions are impeded." Bearing this in mind, the following may be given as suitable definitions:—

Pathological anteversion is that position of the uterus in which the axes of the cervix and of the fundus coincide, the fundus being in front, and in which the normal flexibility of the uterine isthmus is impaired or destroyed (*v.* page 74 and Fig. 41).

Pathological anteflexion is that position of the uterus in which the body is bent markedly forwards, so that the fundus approaches the anterior surface of the cervix, and in which the normal flexibility of the uterine isthmus is impaired or destroyed (*v.* Fig. 42).

Pathological anteversion is not a condition of very much importance. It may be caused by the excessive uterine rigidity which results from metritis, by a shortening of the utero-sacral ligaments dragging the entire cervix backwards, and by small

FIG. 42.—Diagram representing acute anteflexion of the uterus. There is also some degree of retroposition.

tumours situated at the fundus. The symptoms which are associated with it are generally referable to the cause of the condition more than to the condition itself, *i.e.*, to the metritis or pelvic peritonitis as the case may be. Occasionally, a marked degree of anteversion may cause irritability of the bladder. The treatment of anteversion is directed towards the cure or relief of its cause.

Pathological anteflexion is a condition of more importance, and is often found in association with retroposition of the uterus, with stenosis of the cervical canal, and with conical elongation of the cervix.

Ætiology.—Pathological anteflexion of the uterus may occur as a result of:—

(1) Shortening of the utero-sacral ligaments, or the formation of retro-uterine adhesions which drag the isthmus backwards while leaving the fundus free. These cases are associated with retroposition and retroversion of the uterus.

(2) Persistence of the infantile type of uterus. These cases are associated with conical elongation of the cervix and stenosis of the cervical canal, and are probably due to partial failure of development of the anterior uterine wall.

(3) Vaginal fixation of the uterus. These cases rarely if ever give rise to any symptoms.

Symptoms.—The symptoms of anteflexion, as a rule, are due to:—

(1) The acute bend which is found at the junction of the body and cervix.

(2) The accompanying stenosis of the cervical canal.

(3) The accompanying endometritis.

The most prominent symptoms are dysmenorrhœa, sterility, and variable menstrual troubles. The direct cause of the first two is still a matter of some dispute. The pain comes on a day or so before the menstrual discharge, usually ceases on the appearance of the latter, and is severe and paroxysmal in character. Its origin has been attributed variously to the irritation and compression of the uterine nerves caused by the menstrual congestion of the uterus (Fritsch), and to the uterine contractions set up by the retention of menstrual discharge owing to the obstruction caused by the flexion and the stenosis of the cervical canal (Sims). In the latter connection, it may be mentioned that the expulsion of clots from the uterus is found to be attended by the relief of the pain, and any cessation in their expulsion by its return. We have already referred to the objections which have been urged against the obstructive theory of dysmenorrhœa in these cases (*v.* page 24), and need not again do so.

Sterility is caused, in all probability, by the endometritis which is usually present. It is also suggested that the flexion and the stenosis may prevent the entrance of the spermatozoa, but, when

the minute size of these is taken into account, this does not appear very probable, save on the supposition that, as suggested by Dührssen, the mucous membrane of the stenosed cervix does not become everted during coitus, and that consequently the spermatozoa are left for a longer period in the vagina than is normal. In some cases, sterility is due to the non-development of the uterus or ovaries.

Menstrual troubles are the result of the accompanying endometritis, and vary in different cases. Usually, menstruation is scanty, but, on the other hand, it may be profuse, and occasionally there may be metrorrhagia.

On examination of the patient, the uterus is usually found to be small and somewhat retroposed, with a knob-like prominence in front, formed by the body. The cervix is often elongated and conical, and the external os may be so small that it cannot be felt. If we attempt to pass a sound, the latter is stopped by the stenosed internal os. Sometimes, it cannot be passed into the uterus, but generally this can be done if the bend of the sound is increased.

Treatment.—It is useless to attempt to correct the flexion; all that can be done is to endeavour to remove, as far as possible, the stenosis of the cervix and the obstruction caused by the acute bend, and to cure the endometritis. The treatment is thus the same as that described in the case of stenosis of the cervix (*v.* page 66), viz. dilatation (*v.* page 374) or some form of posterior division, preferably Dudley's (*v.* page 396), and curetting (*v.* page 377). The occurrence of pregnancy cures the condition. If there are adhesions dragging the uterus backwards, or shortening of the posterior ligaments, some relief may be obtained by breaking down or stretching the adhesions, or stretching the ligaments (*v.* page 408).

Anteposition.—Anteposition of the uterus is that condition in which the uterus as a whole is displaced in a forward direction.

It is usually caused by tumours, or accumulations of blood, pus, or adherent intestines in Douglas' pouch (*v.* Fig. 43). More rarely, it is caused by cicatricial contractions—the remains of an anterior parametritis—dragging the uterus forwards towards the symphysis. The symptoms, which arise from anteposition of the uterus, are due to the cause of the displacement rather than to

the displacement itself. If the latter is due to tumours or other enlargements, the treatment suitable to them should be adopted; if to old parametritis, attempts must be made to get the exudate re-absorbed.

Lateral Displacements.

Lateral displacements of the uterus include dextro- and sinistro-version and flexion, and dextro- and sinistro-position. The meaning of these terms has been already explained (*v.* page 69).

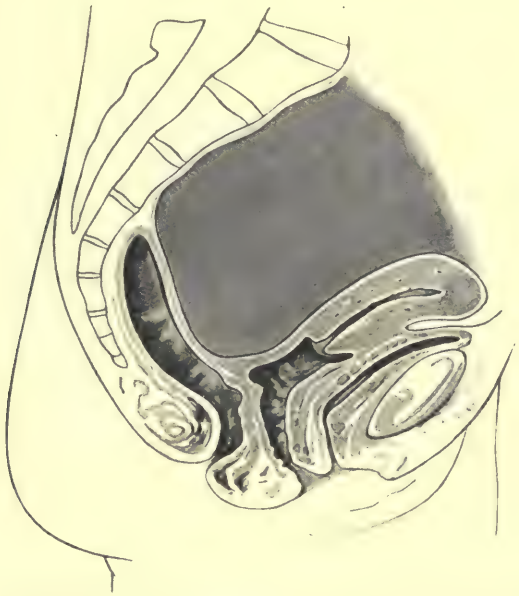


Fig. 43.—Anteposition of the uterus due to the presence of a tumour in Douglas' pouch.

Ætiology.—Dextro- and sinistro-version and -flexion are most frequently caused by contraction of one broad ligament occurring as a result of parametritis, and by the adhesions formed in the course of an attack of pelvic peritonitis. Rarely, these displacements are due to the pressure of tumours. The side to which the uterus is deflected depends upon the part of the broad ligament which has become shortened. If the contraction takes place at the top of the ligament, then the body of the uterus is displaced to the same side as the contraction. If the contraction

takes place about the level of the os internum, then the cervix is dragged to that side, while flexion of the body occurs in the opposite direction (*v.* Fig. 44).

Dextro- and sinistro-positions of the uterus are produced by very much the same causes as are the foregoing displacements, that is to say, tumours and other enlargements, particularly when they occur between the layers of the broad ligament, contractions of the broad ligament, and peritoneal adhesions. A unilateral parametric exudate is a common cause, and will tend to push the

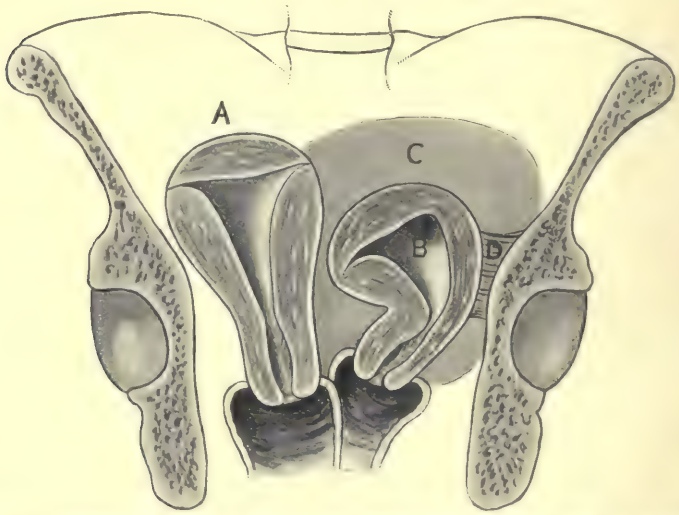


FIG. 44.—Diagram representing some lateral deviations of the uterus. A. Uterus in extreme dextroposition, the result of the pressure of an exudate, C, in the right broad ligament. B. The same uterus in a position of sinistroversion, dextroflexion, and sinistroposition as a result of the absorption of the exudate and the consequent cicatricial contraction of the ligament.

uterus towards the opposite side of the pelvis. When the exudate has undergone absorption, and is represented by a contracted ligament, the latter will pull the uterus towards the same side of the pelvis. In such cases, dextroposition of the uterus is frequently associated with sinistroflexion, or *vice versâ* (*v.* Fig. 44).

Treatment.—The treatment of these cases is determined by the cause. Displacements, which are due to the presence of a tumour, will be corrected by the removal of the tumour. The treatment of cases due to inflammatory changes will be discussed under the head of pelvic peritonitis (*v.* page 241).

Torsion.

Torsion of the uterus consists in a rotation of the uterus as a whole on its axis away from the median plane, either towards the right—dextrotorsion, or the left—sinistrotorsion. The normal position of the uterus is one of slight dextrotorsion. "The normal position of the uterus is not exactly median, the anterior surface of the uterus facing the bladder does not look exactly forwards, but rather forwards and to the right, and when the bladder is empty the vaginal portion lies rather to the left, the fundus rather to the right of the median plane" (Schultze). A pathological degree of torsion is most frequently associated with an unequal degree of contraction or relaxation of the utero-sacral ligaments, such as occurs in posterior parametritis or peritonitis, and in subinvolution.

The diagnosis of a pathological degree of torsion is made by careful bimanual examination. The treatment, if any is required, is that of the pathological condition to which the torsion is due.

Inversion.

When the form of the uterus is altered in such a manner that the inner surface of the organ is turned outwards, and the outer surface inwards, the uterus is said to be inverted (Schultze). This form of uterine displacement is exceedingly rare, and is apparently becoming more so every day—a fact probably due to the more frequent early cure of those conditions, *e.g.*, submucous myomata, which predispose to the occurrence of chronic inversion, and, in the case of acute inversion, to the better management of the third stage of labour.

Degrees.—Schultze describes three degrees of inversion, as follows:—

(1) The first degree comprises those cases in which the inverted fundus lies at or above the os externum. This degree, which is the initial stage of all inversions, is rarely if ever permanent, as it tends either to become reduced, or else to continue and pass into one of the succeeding degrees.

(2) The second degree comprises those cases in which the fundus has descended lower, and in which more or less of the inverted uterus lies below the external os. It is the degree in which chronic inversion is usually met.

(3) The third degree comprises those cases in which the entire uterus, including the cervix, has become inverted (*v.* Figs. 45, 46).

Varieties.—Two varieties of inversion are met with :—

I. Acute inversion.

II. Chronic inversion.

I. Acute Inversion.—Acute inversion is, strictly speaking, an obstetrical condition, but it is advisable to say a few words about it here. An inversion of the uterus is termed *acute* when it occurs immediately after confinement. It is said to be the more common variety of inversion, although it is one of the rarest of obstetrical complications.

Ætiology.—Three conditions must be associated in order to permit the occurrence of either the second or third degree of inversion (Schultze) :—enlargement of the cavity of the uterus; relaxation of part of its wall; and a cervix which is sufficiently dilated, or capable of being sufficiently dilated, to allow the passage of the body of the uterus. All these conditions are fulfilled after delivery in those cases in which the uterus does not contract well. With these conditions present, if the intra-uterine pressure becomes less than the intra-abdominal pressure the fundus dimples in, and, if this relationship between the two pressures continues, inversion goes on until it becomes complete. Accordingly, any factor which brings about this relationship between the two pressures may be regarded as the exciting cause of the inversion. The principal of these factors are :—

(1) Dragging upon the placental site—in the case of a fundal insertion of the placenta—by pulling upon the cord while the placenta is still adherent.

(2) Violent straining associated with sudden emptying of the uterus, as :—precipitate labour; or severe straining and pressure, during the removal of the placenta, while the uterus is in a relaxed condition (Winckel).

Symptoms.—The occurrence of acute inversion is usually marked by the collapse of the patient, a collapse which may come on either immediately after inversion occurs, or, more rarely, after a few hours. If the placenta has been separated in part or altogether, there will also be severe hæmorrhage.

Diagnosis.—If the hand is placed upon the abdominal wall, the absence of the fundus of the uterus from its usual position will be readily determined. If a careful bimanual examination is made, it may be possible to determine the existence of a cup-shaped depression corresponding more or less exactly to the former position of the cervical canal. At the same time, the vagina is found to be occupied by a globular tumour to which the placenta may or may not be attached, or in extreme cases the vagina may be also partially or completely inverted, and so the inverted uterus lie in part or altogether outside the vulva. The diagnosis is then at once obvious. If the inversion is only partial, the fundus of the uterus will be felt with a cup-shaped depression in its centre.

Treatment.—The treatment consists in the detachment of the placenta, the replacement of the uterus, and the adoption of measures calculated to keep it in its normal position.

There is nothing special to be said with regard to the removal of the placenta, it is carried out in the ordinary manner, the greatest care being taken to ensure asepsis. The replacement of the uterus is usually not a very difficult matter. The uterus is grasped in the hand, and pushed gently upwards, endeavouring to return first the part that came down last. If the size of the uterus prevents its reduction, it is possible that the proceeding would be facilitated by a temporary partial anæmia of the uterus by the application of adrenalin, and so a temporary reduction in the size of the uterus. At any rate, adrenalin might be tried, as, if used in a sterile condition, it could cause no harm and might prove of value.

As soon as the uterus has been replaced, it is douched out thoroughly, and plugged firmly with iodoform gauze with the object of preventing the recurrence of the displacement.

Prognosis.—An acute inversion, if left untreated, is frequently fatal. If the patient survives, it passes into the chronic condition. If the condition is recognised, and treated before the patient has lost an excessive quantity of blood, and before the uterine cavity has become infected, the prognosis is fairly good.

II. Chronic Inversion.—Chronic inversion is the term applied to an acute inversion which has not been reduced, and in which

the patient has survived, and also to an inversion which arises slowly in a non-parturient uterus.

Ætiology.—As has just been mentioned, a chronic inversion may be the result of the acute variety. Such a cause for chronic inversions is however rare, as, if an acute inversion is not treated, the patient generally dies. The common cause of chronic inversion is a sessile or polypoid myoma in the uterine cavity,

FIG. 45.—Complete inversion of the uterus.

which drags down the fundus after it as it is expelled from the uterus. Scanzoni considered that sessile myomata have a greater tendency even than polypi to produce inversion, which result he attributes to thinning of the muscular tissue at the seat of attachment of the tumour. Also, if a tumour with a long pedicle is expelled from the uterus, the cervical canal has sufficient time to close behind the tumour before the fundus is pulled down into contact with it; whereas, in the case of a sessile

tumour, the fundus follows the tumour so closely that it finds the cervix sufficiently dilated to allow it to descend into the vagina.

FIG. 46.—Chronic inversion of the uterus and the vagina. U. Uterus. A.V. Anterior vaginal wall. (From a photograph lent by Dr. Arthur Holmes.)

Symptoms.—The symptoms are recurrent hæmorrhages more or less profuse in amount, sacral pain, a feeling of weight in the pelvis and an inclination to strain, and, if the tumour or the uterine wall sloughs, a profuse and fœtid discharge. In some cases, descent of the uterus accompanies the inversion, and then a

tumour will be found outside the vagina (*v.* Fig. 46); if there is no descent, the tumour will occupy the vagina (*v.* Fig. 45).

Diagnosis.—The diagnosis of inversion will be readily made by a bimanual examination. A tumour will be found in the vagina, and the body of the uterus will have disappeared from its usual position. If the patient is not too stout, a cup-shaped depression, as in the acute form, will be felt just above the roof of the vagina, and the ovaries may be palpated at the edge of it.

An inverted uterus has to be distinguished from a polypus projecting from a normally situated uterus into the vagina. The two conditions somewhat resemble one another, if only a cursory examination is made, but, if the case is carefully examined, no difficulty presents itself. The distinguishing points are:—In the case of inversion, the body of the uterus is not found in its usual position, while in the case of a polypus it occupies its usual position. Again, in a polypus, the cervical ring can be felt surrounding the pedicle, and, a sound passed through this ring by the side of the pedicle will pass upwards into the uterine cavity. In the case of an inverted uterus of the third degree, no such ring will be found, and it will be impossible to pass a sound upwards beside the tumour. In the case of an inverted uterus of the second degree, a ring can be felt round the tumour, but the sound can only be passed upwards through it to a very slight extent.

Treatment.—Chronic inversion of the uterus may be treated by the following methods:—

(1) Gradual reduction of the inversion, after removal of any tumour present.

(2) Rapid reduction of the inversion, after removal of any tumour present.

(3) Extirpation of the inverted uterus.

(1) **Gradual Reduction.**—Gradual reduction of the uterus can be effected in many cases, after the removal of any tumour present, by the prolonged use of some form of repositor, as Aveling's or Tait's, or by plugging the vagina with iodoform gauze in such a manner as to cause an upward pressure on the inverted uterus (Pozzi). The gauze is changed daily until the inversion is reduced. Gradual reduction, however, has been given up to a large extent, and its place taken by some form of rapid reduction.

(2) **Rapid Reduction.**—Rapid reduction is performed manually either without or with preliminary dilatation of the narrow isthmus of the inverted uterus. In all cases, an attempt should be first made to replace the uterus with the hand, as in the acute form. Two methods of doing this are shown in the accompanying diagrams (*v.* Figs. 47, 48). In method A, the part of the uterus which was inverted last, is to be replaced first, and the fundus consequently is not reduced until last. As a result, at no time is more than one ring of uterine tissue passing through the obstructing isthmus. In method B, on the other hand, the fundus is first reduced, and, as a result, two rings of uterine tissue have to pass through the isthmus at the same time. In order to gain extra power, Freund inserted several silk sutures

FIG. 47.

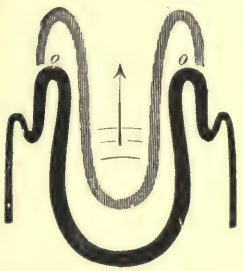


FIG. 48.

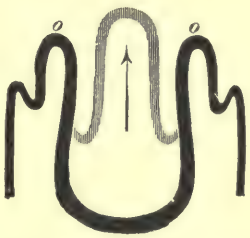


FIG. 47.—Method A, of reducing a chronic inversion of the uterus. (*Schultze.*)
FIG. 48.—Method B, of reducing a chronic inversion of the uterus. (*Schultze.*)

through the ring of cervical tissue, and by their help drew down the cervix as he pressed up the body. If method A fails, the advantages of method B can be obtained in the following manner without adding to the number of rings of uterine tissue which have to pass through the isthmus (Schultze) (*r.* Fig. 49):—Draw the uterus downwards as far as possible, so that the fundus descends from *a* to *b*, and so convert an inversion of the second degree into one of the third degree. Then, endeavour to fix the edge of the funnel as firmly as possible at *o'*, and press the fundus upwards towards *c*, and finally to *d*, as shown.

If manual reduction fails, and the patient has not reached the menopause, and hence it is advisable to preserve the uterus if possible, various operative proceedings have been recommended with the object of directly dilating the constricting isthmus. The operation, which appears to be at once the safest

and to offer the best chance of success, is that originated by Küstner (*v.* page 472). He makes an opening from the vagina into Douglas' pouch, then incises the constricting isthmus, and then reduces the body through the widened passage thus obtained. Another method of dilating the isthmus is by opening the abdomen in the middle line, and then forcibly dilating the constricting ring with the fingers or with metal dilators. It is a course of procedure

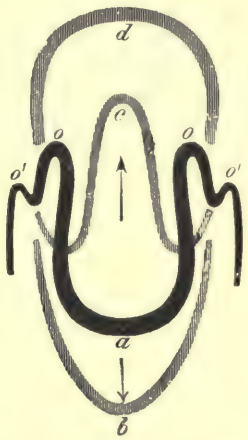


FIG. 49.—A modification of method B of reducing a chronic inversion. (*Schultze.*)

which has not very much to recommend it, and has failed several times in the most skilful hands.

(3) **Extirpation.**—Extirpation of the inverted uterus, by vaginal hysterectomy, is the treatment indicated in the presence of a tumour which cannot be removed without permanently damaging the uterus, or which is found to be malignant. It is also indicated, in women who have passed the menopause, in preference to too violent attempts at reposition, and in young and middle-aged women as a last resource.

As an alternative to complete hysterectomy, Kelly recommends amputation of the inverted uterus just below the vaginal attachment. The stump of cervix left can then be easily reduced.

CHAPTER VIII.

DISEASES OF THE UTERUS (*continued*).

Traumata of the Uterus. Inflammatory Diseases of the Uterus — Corporeal Metritis: Acute; Ætiology, Pathology, Symptoms, Complications, Treatment: Chronic; Myometritis, Ætiology, Pathology, Symptoms, Treatment; Endometritis, Varieties, Ætiology, Pathology, Symptoms, Treatment—Cervical Metritis: Acute, Ætiology, Pathology, Symptoms, Complications, Treatment; Chronic, Ætiology, Pathology, Symptoms, Treatment.

TRAUMATA OF THE UTERUS.

Traumata of the uterus may occur during parturition. The commonest is laceration of the cervix, a condition which is associated with endometritis and endocervicitis. It will be discussed in the chapter on "Traumata of the Genital Organs."

INFLAMMATORY DISEASES OF THE UTERUS.

Inflammatory diseases of the uterus can be included under the one term *metritis* (*μήτρα*, the womb) or inflammation of the uterus, and this can be subdivided as follows:—

- Metritis
  - Corporeal
    - Acute
    - Chronic
      - Myometritis.
      - Endometritis.
  - Cervical
    - Acute
    - Chronic

Corporeal Metritis.

Corporeal metritis, that is metritis of the body of the uterus, is met with in two varieties:—

I. Acute corporeal metritis.
II. Chronic corporeal metritis.

I. Acute Corporeal Metritis.—Acute corporeal metritis may be subdivided into myometritis and endometritis—according as it

attacks the muscular wall or the endometrium—if it is thought well to do so. As, however, the two conditions probably always co-exist, such a course seems unnecessary. It will accordingly be discussed under a single heading.

Ætiology.—Acute metritis is usually the result of the infection of the uterus with pyogenic organisms. It occurs most frequently as the result of gonorrhœal infection, or of septic infection occurring during or after parturition, or during operative interference

FIG. 50.—Uterus removed from a patient who died of acute streptococcic infection. 1. Left Fallopian tube. 2. Left ovary. 3. Os externum. 4. Right ovary. 5. Right Fallopian tube. (From the author's "Manual of Midwifery.")

with the uterine cavity. Acute metritis may also occur during the course of severe attacks of the eruptive fevers.

Pathology.—The acute septic metritis, which occurs during the puerperium, is usually due to a virulent streptococcal or staphylococcal infection. It may start at any part of the inside of the uterus, and usually remains localised to the area first infected. The interior of the uterus is quite smooth, the wall as a whole is firm, and it is evident that there has been no marked destruction of tissue (*v.* Fig. 50). There is consequently no tissue which could be removed by the curette.

Microscopic examination of the endometrium in these cases

shows the nature of the changes which are present. There is superficially a thin layer of necrosed cells blended with fibrinous exudate, to which the unnatural smoothness is due. Immediately below this, in the deeper layers of the endometrium, there is a slight degree of leucocytic infiltration (*v.* Fig. 51), which, in amount, is in marked contrast with what we see in putrid endometritis. Both towards the surface and in the leucocytic zone,

FIG. 51.—Puerperal endometritis due to streptococcus infection, showing how slight is the development of the leucocytic wall. (*Williams.*)

cocci are present in large numbers (*v.* Fig. 52), and they can be also found in the lymph channels which pass through the muscular walls towards the peritoneal surface. The entire appearance points to an attack so rapid that the usual tissue resistance to bacterial invasion has not had time to occur.

In cases of less virulent infection, the uterus is large, its wall thickened, and its tissue friable. The surface shows much more marked changes than in the acute septic variety, but there is not as much destruction of tissue as in putrid endometritis.

The exudate is purulent and often bloody, and consequently the lochia are increased in quantity. There are, in fact, the usual results of a severe catarrh with a purulent exudate. In some cases, the exudate contains a larger number of cells than does ordinary pus, and a distinct false membrane, lining some portion of the interior of the uterus, appears. To this condition the

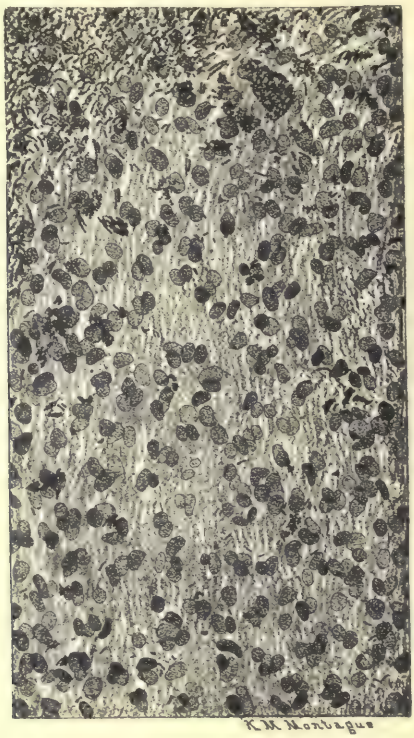


FIG. 52.—Streptococcic endometritis, showing bacterial invasion of leucocytic wall. × 800. (*Williams.*)

term "diphtheritic endometritis" was formerly applied, and it was described as a distinct variety. There is, however, no justification for such a distinction, as a line cannot be drawn between it and the other conditions described.

In many of the cases of this class, the colon bacillus is present, either alone, or more commonly as one element of a mixed infection. When it is present, the lochia are foul-smelling, and often frothy owing to the production of gas, putrefactive

organisms are also frequently present in the uterus. The toxins produced by them facilitate the advance of the parasitic organisms into the uterine walls, or, in other words, the presence of a decomposing fluid adds virulence to comparatively inactive pyogenic germs.

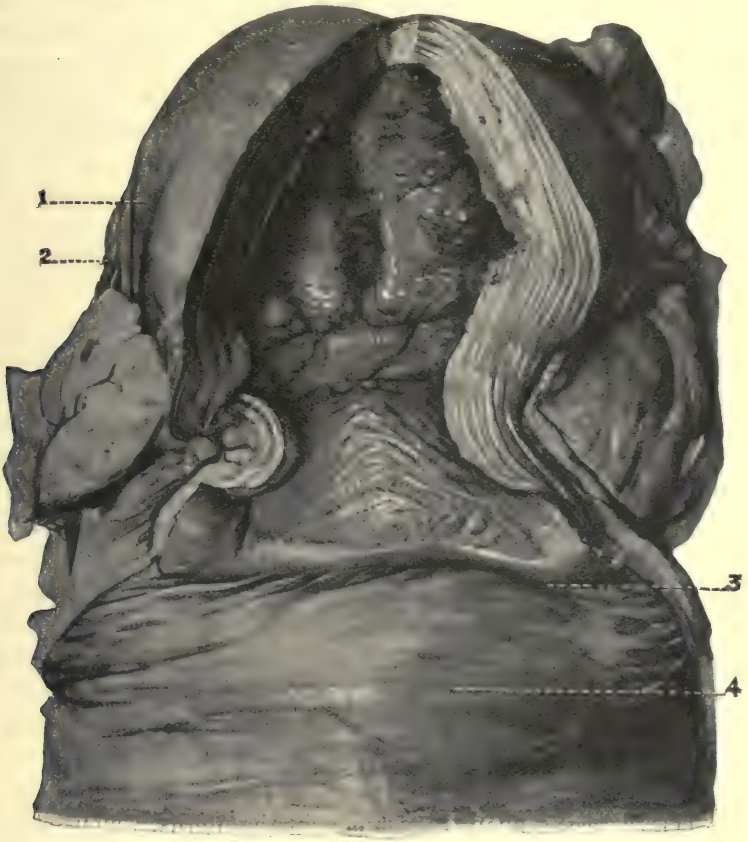


FIG. 53.—Uterus removed from a patient who died of mixed septic and saprophytic infection.

1, Fallopian tube; 2, ovary; 3, os externum; 4, vagina. (From the author's "Manual of Midwifery.")

Occasionally, a very mild form of septic infection occurs without any general symptoms of importance. In such cases, the inflammation is in the form of a slight catarrh, and in puerperal cases the lochia are at first diminished, but afterwards increased. This form may result from direct extension of a catarrh of the

vagina, and is due to the presence of the *Staphylococcus Aureus*. Some of these cases present a close resemblance to the diphtheritic form just mentioned.

In most cases of endometritis of septic origin, an extension of the infection into the muscular coat of the uterus occurs. Such a metritis is not a separate condition, but is merely an extension of the infective process already described. In some cases, however, a metritis of a different kind occurs. During their passage through the lymphatics of the uterine wall, bacteria may become lodged at any point, and there give rise to isolated foci of inflammation, possibly resulting in abscess formation, either in the muscle, or, more frequently, between the muscle and the peritoneal covering.

In acute gonorrhœal infection, the changes present are akin to those met with in the milder forms of septic infection.

The changes met with in acute metritis, the result of acute infective diseases, were described by Massin of St. Petersburg. They may be shortly summarised as follows:—The mucous membrane is markedly injected, either in places or throughout its entire extent. The vessels, especially the small veins and capillaries, are increased in size. In many cases, this dilatation is so considerable as to cause rupture and consequent hæmorrhages between the muscular layers and into the mucous membrane. In some cases, the glands are markedly enlarged, their epithelial lining is cloudy and swollen, and the cells stain feebly. Newly formed granular elements are frequently found arranged round the glands in the form of a belt. The muscular layer is not so much affected, though its vessels are also injected. From the result of his experiments, Massin concluded that this form of metritis presents three characteristics:—

(1) Increased quantity of blood in the uterus, venous stasis, and inflammation of the vessels.
(2) Granular inflammation.
(3) Diffuse spreading of this inflammation.

He further says that in considering the ætiology of acute and chronic metritis, we must always think of the possibility of the condition being due to a previous acute infectious disease.

Symptoms.—The uterus is slightly enlarged, and is very tender. A more or less profuse purulent discharge escapes from the cervix, save in cases of streptococcal puerperal infection, when

there is usually a cessation of all discharge. The temperature is high, reaching from 103° F. to 105° F. The pulse is very rapid, and may range from 120 to 140. There are the general symptoms of septic absorption, or of actual acute sepsis. The patient may complain of intense pain over the uterus, and, if the infection extends beyond the uterus, there are the symptoms of peritonitis.

Complications.—The great danger of acute metritis is that of extension. This may occur in several directions:—

(1) Into the general circulation,—(*a*) by the veins, (*b*) by the lymphatics; so causing (*a*) pyæmia, (*b*) lymphatic sepsis.

(2) Into the tubes, and from there into the peritoneal cavity, so causing salpingitis, pyosalpinx, and local or general peritonitis.

(3) Into the tissues round the uterus, so causing parametritis.

The secondary conditions will be discussed in their proper place.

Treatment.—The correct treatment of local septic infection of the genital tract after delivery is still the subject of discussion. Many writers, and notably Prior of New York, advocate the adoption of heroic measures, to which we shall presently refer. Others, including the majority of British obstetricians, advise the adoption of less heroic measures, the chief of which are repeated douching, and curetting of the infected uterus. Still others, notably Bumm and Whitridge Williams, consider that curetting as a routine measure is by no means to be recommended, and that repeated intra-uterine douching, especially in streptococcal infection, is not only useless but actually harmful. In the face of these diverse opinions, for all of which those who hold them can produce supporting statistics, it is unwise to attempt to dogmatise, and we shall content ourselves with describing the treatment we consider most suitable.

In deciding upon the course to adopt in the case of a purely septic infection, we should be guided by the condition of the interior of the uterus. If the endometrium is shaggy, and small portions of retained placenta, membranes, and decidua are adherent to it, they should be gently removed with the finger or with a blunt curette, and the uterus then plugged with iodoform gauze. This plug must be removed at the end of twelve hours, and, if necessary, a fresh one inserted after douching out the cavity. If, on the other hand, the inside of the uterus is quite

smooth, a condition which is found in the most acute forms of streptococcal infection, curetting is contra-indicated, and the douche and the plug are probably useless. In these, and indeed in all forms of local septic infection of the uterus, we should be inclined to inject repeatedly a strong solution of formalin (from twenty to forty per cent.) into the uterine cavity. The formalin should be quickly injected in sufficient quantity to ensure its reaching the entire surface of the endometrium, *i.e.*, from two to four drachms, and washed out after fifteen to thirty seconds have elapsed. The penetrating power of formalin is considerable, and our experience of its use in non-puerperal cases leads us to believe that, injected in the manner we have described, it would not produce any harmful effect upon the patient, and would exert a deterrent effect on the development of the invading micro-organism.

The constitutional treatment of local septic infection consists in the maintenance of the patient's strength in every way possible, such as by the free administration of stimulants, and of such drugs as iron, strychnine, and digitalis when the condition of the heart necessitates its use. The administration of ergot is also indicated, with the object of promoting uterine contraction, and so lessening the absorption of toxins from the uterus. The bowels must be made to act regularly. If the temperature attains a very high range, it should be brought down by cold sponging or the cold pack. If the infection is streptococcal, the use of a polyvalent anti-streptococcic serum and the subcutaneous injection of saline solution may be advisable. If pain is a prominent symptom, hot stupes should be applied to the hypogastrium, and warm vaginal douches be given. Leeches over the hypogastrium may also be tried.

In acute gonorrhœal metritis, if the infection is limited to the cervix, the latter should be well wiped out with small pieces of cotton wool twisted round the end of a probe, and then treated with one or other of the different antiseptics which are known to exercise a germicidal effect on the gonococcus. Perhaps the best of these is protargol, used in a two to five per cent. solution. It may be applied at intervals to the cervical canal through a speculum, or, as suggested by Reed, the cervical canal may be plugged with a small piece of gauze soaked in the protargol solution. If the uterine cavity is also infected, it may be plugged with a similar

piece of gauze. As protargol has a powerful bactericidal effect on the gonococcus, the danger of causing an extension of the infection need not be feared, as any micro-organisms coming into contact with the protargol will be killed. The gauze should be changed every forty-eight hours. When the acute stage of the infection has passed off, the infected mucous membrane should be removed with the curette, and the cavity again treated with protargol. The mode of preparing protargol solution has been already described (*v.* page 28). In metritis, the result of acute infective fevers, treatment as a rule is not indicated during the acute stage. Later, if the condition becomes chronic, it will require to be treated by curetting, etc.

Of late, the injection of super-heated steam into the uterine cavity—a proceeding known as "atmocausis"—has met with considerable success in septic cases. The steam is injected through a carefully insulated catheter at a temperature of 239° F. for a period varying from fifteen to forty seconds. A convenient form of boiler for generating steam at this temperature has been devised by Pincus (*v.* page 400).

II. Chronic Corporeal Metritis.—Chronic corporeal metritis must be subdivided into two forms according to the part of the uterine body it attacks :—

(A) Chronic myometritis.

(B) Chronic endometritis.

Chronic Myometritis.—Chronic myometritis is the term applied to chronic metritis involving the muscular coat of the uterus, as opposed to chronic metritis involving the endometrium. This condition is also termed parenchymatous metritis—especially by continental writers, but, as the term parenchyma is generally used to signify the glandular portion of an organ, it is confusing to apply the adjective to the muscular portion of the uterus. Myometritis is so closely connected with endometritis that it is doubtful whether it should be classified as a separate condition. Endometritis may occur without any obvious accompanying myometritis, but the only cases in which myometritis occurs without an antecedent endometritis are in the rare instances in which it results from the extension of neighbouring extra-uterine inflammation. On account of the extremely intimate connection between the endometrium and the muscular coat of the uterus,

infection of the former is almost certain to extend into the latter. If the extension is slight, it is masked by the symptoms of the accompanying endometritis, but if it is considerable, the existence of myometritis as a distinct condition can be determined.

Ætiology.—Chronic myometritis occurs most frequently as the result of the extension of chronic endometritis, and, more rarely, of peri- or parametritis, consequently their causation is alike (*v.* pages 132, 242). It is regularly found as a cause, or as a consequence, of subinvolution of the uterus after delivery. It is also probable that chronic myometritis may follow an acute myometritis. This condition, which is a rare one, has been described by Addinsell, and called by him chronic infective metritis.

Pathology.—The pathological changes in chronic myometritis following chronic endometritis are not well marked. They may be summed up as follows (Shaw) :—

(1) The uterus is considerably enlarged, and this increase affects all its diameters. On an average, its length is almost half as long again as the normal length, its walls are nearly twice as thick as the normal walls, and its weight is three times greater than the normal weight.

(2) There is a considerable general hypertrophy of the muscular and connective tissue elements of the wall, the connective tissue being increased slightly more proportionally than is the muscle.

(3) The changes met with in the vessels are variable and not characteristic. In forty-eight per cent. of the cases examined by Shaw, the vessels were not increased in number, nor were there any changes observed in their walls. In eighteen per cent. of cases, the tunica media of the large vessels was greatly thickened, the result of fibrous deposit. In fourteen per cent. of cases, a few of the vessels were undergoing hyaline or colloid degeneration. Similar conditions to these were found in the vessels of apparently normal uteri, and in none of Shaw's cases did the condition of the vessels appear to have any connection with the amount of hæmorrhage from which the patient suffered.

(4) The endometrium is almost invariably increased in thickness, and exhibits various changes in the glands.

(5) Evidence of active inflammation, as shown by small-celled infiltration, or cicatricial tissue, is seldom met with.

Shaw concludes from his investigations, that the most important and constant changes met with in chronic myometritis are changes in the thickness and density of the endometrium, changes in the glands, and simple hypertrophy of the myometrium. He also concludes that the hæmorrhage of chronic myometritis is not due to changes in the walls of the blood vessels.

In chronic infective myometritis, the changes found by Addinsell in advanced cases were as follows:—

(1) The uterus is only slightly, if at all, increased in size.

(2) The muscular tissue is divided up into islands separated by broad bands of fibrous tissue. In very advanced cases, almost all traces of muscle tissue have disappeared. The fibrous overgrowth in parts is dense and well organised, whilst in other places it undergoes degeneration.

(3) The arteries are thickened, the tunica media being especially affected. They are also distorted, and many of them are obliterated. At the same time, there is a greatly increased number of small vessels. The lymphatics are dilated, and also increased in number.

(4) There are no characteristic changes in the endometrium, which is usually uninvolved, save in the neighbourhood of the muscle wall, where small groups of round cells can be seen.

(5) There is very distinct evidence of active inflammation, as shown by marked peri-vascular and peri-glandular proliferation of small round cells, which at a later stage invade the entire muscle wall.

The foregoing condition described by Addinsell is probably one of extreme rarity, and evidently differs completely from that which is usually met with, and which we have already described under the head of chronic (non-infective) metritis.

Symptoms.—The uterus is enlarged, and tender to the touch. In the early stages its normal elasticity is still present, but later it becomes firm and rigid. According to Shaw, the tenderness is due to changes in the endometrium, and not to increased sensation in the myometrium. The uterus is frequently retroverted, and, if it is anteverted, the normal anteflexion is absent, a condition which is due to its increased rigidity. The subjective symptoms are those of the accompanying endometritis,—sacral pain, weight and tenderness in the pelvis, and various menstrual disorders. Of the last, menorrhagia is the most common, and more rarely

metrorrhagia also occurs, while dysmenorrhœa occurs in about a third of the cases. It sometimes happens that the amount of blood lost during the periods is so excessive as to cause actual danger to the life of the patient. The uterus is much enlarged, and, if it is in a position of anteversion, there may be irritability of the bladder owing to the pressure of the heavy fundus.

Treatment.—The treatment of chronic myometritis is in the main the treatment of the endo-, peri-, or parametritis which causes it. If the uterus is much enlarged, involution may be hastened by the amputation, or by the excision of a wedge-shaped portion of the cervix (Dührssen). If hæmorrhage is a constant symptom, and cannot be checked by such means as curetting, or atmocausis, or by the removal of any extra-uterine causes of uterine congestion, more radical measures must be adopted. In such cases, vaginal hysterectomy is the usual, and we think, the most satisfactory treatment. As an alternative, the complete obliteration of the uterine cavity by the injection of superheated steam has been recommended and practised (*v.* page 397).

Chronic Endometritis.—Chronic endometritis (*ἔνδον*, within; *μήτρα*) is the term applied to corporeal metritis when it attacks the endometrium. It is one of the commonest, or perhaps the commonest of gynæcological diseases, and it is so closely connected with the majority of these diseases that in treating them measures must also be taken for its cure.

Ætiology.—The causes of chronic endometritis are by no means as definitely ascertained as they ought to be, and even when we consider we know the actual cause, the manner in which it brings about its effect is extremely uncertain. Some writers attribute all forms of chronic as well as of acute endometritis to bacterial action. This is a difficult point to prove, as, in many cases, it is impossible to trace any connection between the onset of the endometritis and the occurrence of bacterial invasion. Also, in the greater number of cases of chronic endometritis, it is impossible to demonstrate the presence of any micro-organism. On the other hand, there is good reason to believe that bacteria may lie in a quiescent condition in some part of the genital tract, waiting for favourable circumstances which will permit their development. And, furthermore, it is quite possible that a bacterial invasion of the uterus may take place, and set up a

metritis, and that later the invading bacterium may disappear, leaving behind it the effects of its visit.

Shortly stated, the bacterial theory of endometritis is as follows:—

(1) All endometritis is bacterial in origin.

(2) In order that the bacteria may infect the uterus, a certain predisposing condition is necessary.

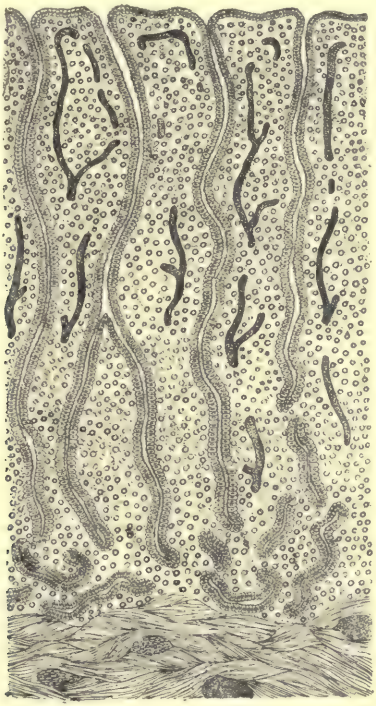


FIG. 54.—Diagram of the structure of the normal endometrium at right angles to the surface. Slightly enlarged. (*Wyder.*)

(3) After the bacteria have disappeared, the effect which they have produced, *i.e.*, metritis, may continue.

If we accept this explanation of endometritis, we must look for two sets of causes:—

(1) Predisposing causes.

(2) Determining causes.

(1) *Predisposing Causes.*—All the predisposing causes of endometritis may be included under the one term *congestion*, as

congestion undoubtedly brings the uterus into the most suitable condition for receiving and developing bacteria. Consequently, in order to learn the predisposing causes of endometritis, it is only necessary to enumerate the various conditions which can bring about congestion of the endometrium. These conditions are :—

(*a*) Uterine displacements, malformations, tumours, and traumata.

(*b*) Menstruation, coitus, and parturition (subinvolution).

(*c*) Constipation, and pulmonary, cardiac, and renal disease.

(*d*) The persistence of decidual remains after abortion or full term labour.

(2) *Determining Causes.*—The determining cause of endometritis is to be found in some form of bacterial invasion. The commonest form met with is gonorrhœal, then septic and saprophytic, and most rarely syphilitic, tubercular, and diphtheritic.

We think that in the bacterial theory there is a considerable mingling of cause and effect ; and that this mingling is due to too forced attempts to differentiate between cause and effect without having sufficient preliminary knowledge to work upon. Even if bacteria are found in the uterus in all cases of endometritis, or if, which is the same thing, the effects of their presence are found, this does not prove that the invasion of the uterus by bacteria was the prime cause of the endometritis, since, though some of these cases may have directly owed their origin to bacterial invasion, others may have owed the bacterial invasion to the endometritis which had been previously started by a mechanical cause of congestion.

Neither the results of pathological research, nor the preventive or remedial treatment of endometritis, fully justify the hypothesis that all cases of inflammation of the endometrium are due to a bacterial infection. Pathological investigation has failed in many cases to decide whether the presence of bacteria was the result or the cause of the inflammation ; as yet we have found it impossible by any methods for the mere prevention of bacterial infection to ward off attacks of endometritis; and in our treatment the best results have followed from dealing not only with the bacterial infection but also with the conditions which produce mechanical congestion of the uterus. It is possible that in the future, as our knowledge increases, we shall be able to establish

on a surer basis the bacterial theory, but at present, for practical purposes, we must assume that endometritis is due to two causes, —bacterial invasion, and congestion of the uterus.

Either of these causes may be primary, but is generally associated with the other, and together they produce one or other of the forms of endometritis described below. Prophylactic measures must be directed to the prevention of both, and curative measures to their removal, and to the removal of their results, which in themselves are further exciting causes.

If we attempt to classify further the causes of endometritis on this basis, we get a classification very similar to that adopted by Winckel :—

(1) *Bacterial Invasion.*—Gonorrhœal, tubercular, septic, saprophytic, diphtheritic, and syphilitic infection, infection by fungi, and infection by amœbæ.

(2) *Congestion of the Uterus.*—Uterine displacements, malformations, tumours, and traumata; subinvolution; tumours of the adnexa; excessive coitus; constipation; cardiac, pulmonary, and renal disease.

Varieties.—The difficulties of classifying the varieties of endometritis, in a suitable and correct manner, are considerable. Of the many classifications which have been adopted we prefer the following, though at the same time we recognise that in many respects it is unsatisfactory :—

(1) Glandular endometritis.

(2) Interstitial endometritis.

(3) Mixed glandular and interstitial endometritis.

It must be distinctly understood that these so-called varieties are, in all probability, only different stages in the course of the same condition.

Pathology.—Macroscopically, in all three forms, the uterus is enlarged and congested ; the mucous membrane is as a rule thickened, injected, and covered with small prominences and inequalities; and, if the endometritis is of long standing, the muscular coat shows the lesions already described under the head of chronic myometritis (*v.* page 130).

Under the microscope, the predominant features of the form of endometritis with which we are dealing are to be seen. In glandular endometritis, there is dilatation of the capillaries and numerous small hæmorrhages, the epithelial and stroma cells

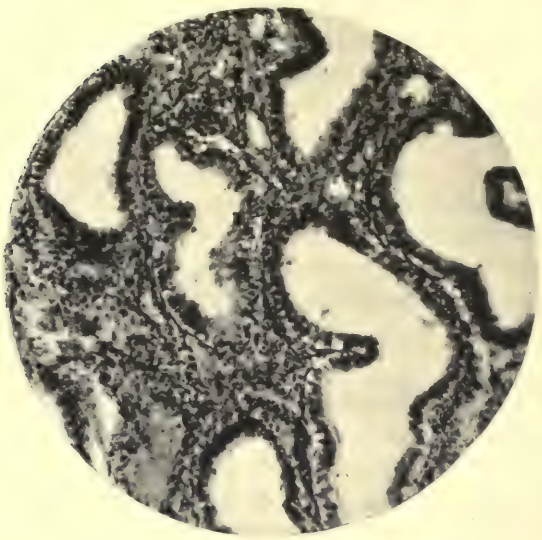


FIG. 55.—Glandular endometritis. The glands are much dilated, the epithelium remaining normal. (*Wigham.*)

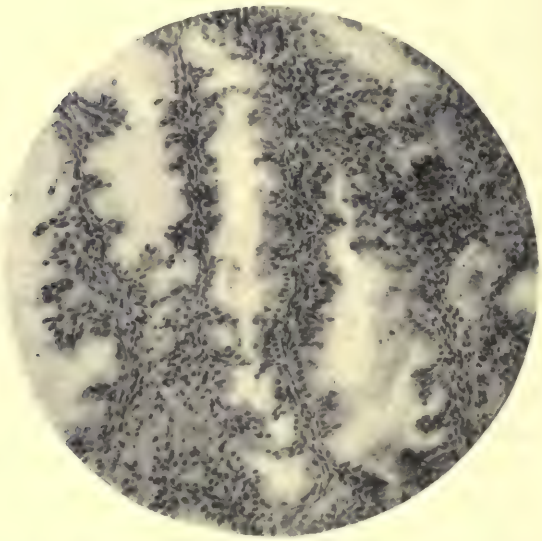


FIG. 56.—Glandular endometritis. The glands are much hypertrophied, showing great increase of epithelium which forms tufts protruding into the glands. There is little interstitial tissue. (*Wigham.*)

become œdematous, and the uterine glands are hypertrophied and their number and ramifications are increased, so that the section resembles that of an adenoma (*v.* Figs. 55, 56). To this condition the name *adenomatous endometritis* or benign adenoma of the uterus has also been given.

In interstitial endometritis, the connective tissue becomes infiltrated with numerous small round cells, and is greatly thickened (*v.* Fig. 57). The capillaries are dilated, and some are ruptured. In a later stage, spindle-cells appear in the endometrium, and, as a result, the glands are so compressed that they atrophy, and in the end almost or entirely disappear, a final condition which is known as *atrophic endometritis.*

In the mixed form, hypertrophy and hyperplasia of the glands occur, accompanied by a round-celled infiltration of the connective tissue (*v.* Fig. 58). At a later stage, as the infiltration increases the glands become atrophied and finally disappear.

In any of the foregoing forms, the endometrium may become necrotic, presumably owing to limitation of its blood supply, or to its separation from the underlying muscular coat by an effusion into its deeper layer. It is probable that the condition known as senile or adhesive endometritis is associated with this change and is the result, first, of a necrosis of the endometrium, and, secondly, of an absence of the normal attempts at reconstitution of the latter owing to the age of the patient and the fact that her sexual life is over. As a consequence of these two factors, the uterine wall is practically uncovered by epithelium and its opposing surfaces become adherent to one another.

A hæmorrhagic form has been described, in which the capillaries are principally affected. They are said to be dilated and increased in number, and their walls become extremely thin. As a result, in an advanced case, the endometrium comes to resemble cavernous tissue, and in places the dilated capillaries give way and cause hæmorrhage (Pilliet).

Symptoms.—The symptoms of endometritis must be divided into those which are due to the local condition, and into those which are due to accompanying constitutional disturbances.

(A) **Local Symptoms.**—The local or uterine symptoms consist in menstrual disturbances of various kinds, in the occurrence of leucorrhœal discharge, and in the general pelvic discomfort and pain associated with the enlargement of the uterus and the

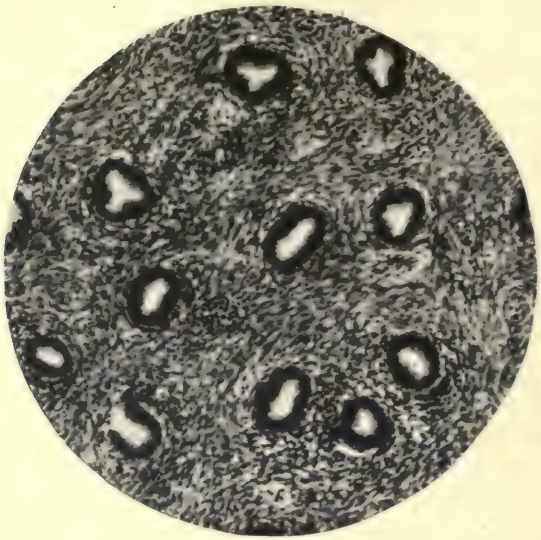


FIG. 57.—Interstitial endometritis. The connective tissue is dense, showing many cell-nuclei, and the glands are small. (*Wigham.*)

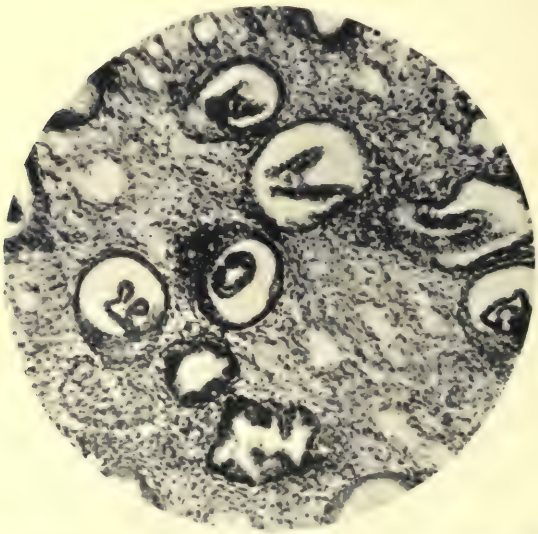


FIG. 58.—Mixed glandular and interstitial endometritis. The glands are dilated and the epithelium hypertrophied, forming invaginations into the glands. The interstitial tissue shows dilated vessels, and is infiltrated with blood. (*Wigham.*)

retro-deviation which are also so commonly present. The menstrual disturbances consist most usually in the occurrence of menorrhagia, and sometimes metrorrhagia, especially in the early stages of interstitial endometritis. More rarely, scanty menstruation or amenorrhœa is met with. This, as a rule, only occurs in cases in which previous menorrhagia has reduced the patient to a condition of profound anæmia, or in cases of atrophic endometritis (*i.e.*, the last stage of interstitial endometritis). In some cases, portions of detached endometrium, or even entire casts of the inside of the uterus, are expelled at the menstrual periods. This constitutes the so-called *exfoliative endometritis* (*v.* page 25).

Leucorrhœa (λευκός, white; ῥέω, I flow) is usually present in all varieties, but it is especially profuse in the glandular form. In the other forms, the source of the discharge is most probably the cervical glands, which are involved in an accompanying endocervicitis. In senile endometritis there is usually a serous and blood-stained discharge, which becomes fœtid if the interior of the uterus is infected.

Pain in varying degree is a very common symptom. It comes and goes, being made worse in frequency and degree by prolonged standing or walking, or over-exertion of any kind. It is referred to the iliac fossæ, the back, especially the lumbar region, and the perinæum. Frequently, it occurs as dysmenorrhœa, especially in exfoliative endometritis (*v.* page 25).

General pelvic discomfort is caused by the increase in size of the uterus and the frequent presence of displacements. It consists in a feeling of weight and fulness in the pelvis, and a "bearing-down" sensation.

Lastly, sterility is often the result of chronic endometritis, and is due either to the diseased endometrium offering an unsuitable nidus for the reception of the ovum, or to the pathological secretion of the uterine and cervical glands proving fatal to the spermatozoa.

On examination of the patient, the uterus is found to be somewhat enlarged, especially in glandular and hæmorrhagic endometritis, and the size and length of its cavity are increased. The uterus may be much softer than normal, or on the other hand it may be much firmer. The latter condition is specially met with in cases associated with very chronic myometritis. The

uterus is usually more tender than normal, in proportion to the acuteness of the inflammation. Its mobility is not affected, unless the condition is accompanied by the presence of pelvic adhesions or parametritis. Its position is not necessarily altered, but in many cases retro-deviations are present, owing to the increase in size of the uterus and the relaxation of the ligaments. The cervix is very commonly hypertrophied, and there may or may not be an erosion.

(B) **General Symptoms.**—The general constitutional symptoms, arising as the result of chronic endometritis, vary greatly in different subjects. They consist in permanent or fugitive ill-defined pains, dyspepsia, cardiac palpitations, neuralgias, migraine, and symptoms of rectal and vesical irritation. Anæmia is often present in those forms which are associated with menorrhagia and metrorrhagia. In some patients, symptoms are observed at intervals arising from the absorption of bacterial products from the uterus (Doléris), and consisting of shivering, vomiting, headache, debility, and slight jaundice.

Treatment.—The complete cure of chronic endometritis is often a very difficult matter. The rational treatment, and the only one which gives any good results in very chronic cases, consists in :—

(1) The removal or cure of any condition which tends to keep the uterus in a state of congestion.
(2) The removal of the diseased endometrium.
(3) The adoption of such measures as will ensure the growth of a healthy endometrium.
(4) The improvement of the patient's general health.

(1) The measures directed towards the removal or cure of those conditions which tend to keep up the congestion of the uterus consist in :—the correction of displacements ; the stretching or breaking down of adhesions ; the removal of tumours of the adnexa or of the uterus ; the relief of chronic constipation ; the prevention of too frequent coitus, or of coitus at all in some cases ; and the cure of cervical lacerations, or erosions, by trachelorrhaphy, amputation of the cervix, or the application of caustics.

(2) The removal of the diseased endometrium is best and most quickly brought about by curetting the uterus and injecting caustics (*v.* page 377). In some instances, it may be thought preferable

to trust alone to the injection of caustics; but, except in mild cases, the relief which this proceeding affords is not so rapid or so complete as is that afforded by curetting. The caustics, which are most usually injected after curetting in these cases, are as follows:—Chloride of zinc (50 per cent.), iodised phenol (iodine 1, liq. carbolic acid 3), tincture of iodine, and liquid carbolic acid. The first three are injected by means of Braun's syringe (*v.* Fig. 59); the last is best applied by means of a sound wrapped round with cotton wool.

We personally dislike all these caustics. Chloride of zinc sometimes acts more energetically than we desire, and may cause almost complete destruction of the endometrium and the endocervix, leading to cessation of menstruation and to stenosis, or even atresia, of the cervix. Iodised phenol has a most unpleasant smell, and tends to block the small holes in an

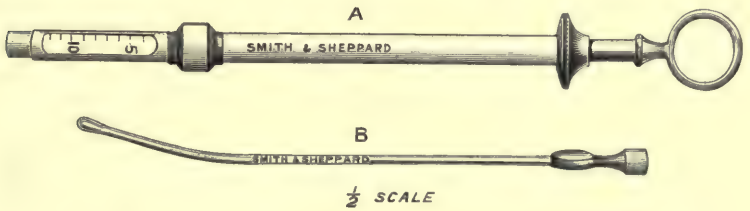


FIG. 59.—Braun's syringe for injecting fluids into the uterine cavity. A. Syringe. B. nozzle.

intra-uterine syringe. Tincture of iodine is not sufficiently strong, and liquid carbolic acid is probably too strong. Formalin (40 per cent. formic aldehyde) is preferable to any of the foregoing. It may be used at a strength of from twenty per cent. up to full strength, and can be readily injected with Braun's syringe. In some cases it causes considerable pain, whilst in others it causes none. If the patient is under an anæsthetic, pain does not matter, but if she is conscious, formalin must be injected with great care. In such cases we commence by injecting a couple of drops of a twenty per cent. solution, and then gradually increase the strength on subsequent occasions. Formalin should be allowed to act for from fifteen to thirty seconds, according to the manner in which it affects the patient, and is then removed by washing out the uterus through a Bozemann's catheter.

In mild cases of endometritis, it is sometimes found sufficient to apply astringents, or mildly caustic solutions, to the

endometrium by means of Bandl's hollow sound (*v.* Fig. 60). This instrument is used as follows :—The vagina is well douched, and a cylindrical speculum of the largest size which can be introduced is passed into the vagina, and rotated until the cervix projects into its upper orifice. The anterior lip is then caught in an American forceps, and the hollow sound is passed into the uterus. The speculum is filled with the solution which it is proposed to use, and the latter is carried into the uterus by partially withdrawing and again pushing up the sound several times. The solutions generally used for this purpose are pyroligneous acid, sulphate of copper (40 grs. to the ounce), nitrate of silver (20 to 30 grs. to the ounce), and formalin. The latter has many advantages, and may be used at a strength of a drachm to the ounce of water.

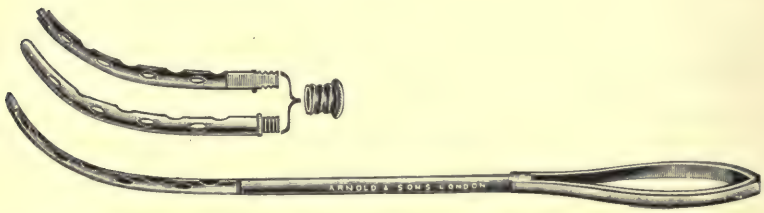


FIG. 60.—Bandl's hollow sound—Author's modification, the end of which can be divided into two for cleaning.

In endometritis due to gonorrhœal infection, a piece of gauze soaked in a two and a half to a five per cent. solution of protargol may be passed into the uterus, and allowed to remain there for twenty-four to forty-eight hours, and this procedure repeated several times.

In true hæmorrhagic endometritis, curetting and the application of caustics may be tried, but it is usually found necessary to extirpate the uterus in order to check the hæmorrhage. The intra-uterine injection of steam (Pincus) has been sometimes found of use (*v.* page 397).

(3) As has been mentioned, curetting is the best and most rapid method of removing diseased endometrium, but the treatment of the case cannot be considered as finished once this operation is performed. Alone, it is rarely sufficient to effect a cure, since, in addition to the removal of the diseased endometrium, it is necessary to ensure as far as possible the growth of a healthy

endometrium. To obtain this result, it is usually necessary that the new endometrium should be again removed in part, or entirely, by the application of caustics. In cases of long-standing chronic endometritis, the application of formalin or of some of the above-mentioned drugs by means of Bandl's sound is necessary. The first application may be made a fortnight or so after the curetting, and it may be repeated some three times or oftener, according to the nature of the case, at intervals of a week or a fortnight.

(4) The improvement of the general health of the patient is a matter of considerable importance. It can be effected in most cases by the regulation of the bowels, by increased and suitable nourishment, and by the judicious use of tonics. In many cases, absence from home is advisable, both for its general effect on the patient and as a means of preventing coitus for the time.

Cervical Metritis.

Cervical metritis, like corporeal metritis, may occur in two forms:—

I. Acute cervical metritis.
II. Chronic cervical metritis.

I. Acute Cervical Metritis.—Acute cervical metritis is a very rare condition, except in association with acute corporeal metritis. Occasionally, however, it occurs by itself.

Ætiology.—The ætiology of acute cervical metritis is practically the same as the ætiology of the acute form of corporeal metritis. Gonorrhœa is perhaps its commonest cause, in cases in which the cervix alone is attacked. In cases due to the invasion of septic micro-organisms, the entire uterus is usually affected. Septic infection most commonly occurs after parturition, more rarely after gynæcological operations.

Pathology.—The cervix is enlarged, œdematous, injected, the external os patulous, and the cervical canal slightly everted. If the inflamed surface is rubbed with the finger, slight bleeding occurs. In the septic form, there is usually a pseudo-membranous grey exudation covering the abraded areas. There is also a profuse, and sometimes fœtid discharge. Similar changes are found in the glands and interstitial tissue, as in acute corporeal metritis.

Symptoms.—If the body is infected as well, the symptoms caused by the cervical condition will be obscured by those caused by the corporeal condition. If the cervix alone is affected, the symptoms will be similar to those caused by an acute vaginitis (*v.* page 52).

Complications.—The danger of acute cervical metritis is that the infection may extend to the uterine cavity, and so set up an acute corporeal metritis with its complications.

Treatment.—The treatment of these cases, if complicated by acute vaginitis or corporeal metritis, will be the same as that of the complication. If it exists alone, it is treated by rest in bed

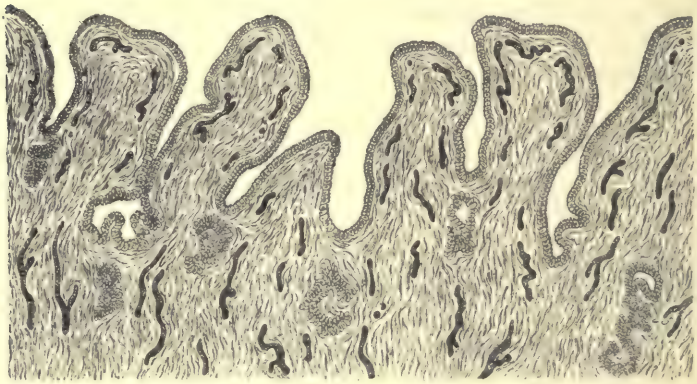


FIG. 61.—Section of the normal mucous membrane of the cervix. Slightly enlarged. (*Wyder.*)

and by the use of warm vaginal douches, insufflation of iodoform on the cervix, and the tamponing of the vagina with iodoformi gauze or with plugs of cotton wool soaked in glycerine and ichthyol, and of the cervix with gauze soaked in a two and a half to five per cent. solution of protargol. The cervix may also be bathed in formalin (a drachm to the ounce of water) applied through a cylindrical speculum, and the formalin carried into the canal by means of a probe or sound covered with cotton wool.

II. CHRONIC CERVICAL METRITIS.—Chronic cervical metritis usually attacks all the tissues of the cervix, though as a rule the glandular and interstitial structures of the mucous membrane are the parts most involved, hence the condition is commonly known as *endocervicitis* (ἔνδον, within; *cervix*, the neck).

Ætiology.—The causes of endocervicitis are very similar to those of endometritis, with which it is usually associated, either as an antecedent condition or as a consequence.

Pathology.—The cervix is hypertrophied, and somewhat œdematous, and its lips are everted. Under the microscope, similar changes to those in endometritis are seen, with the exception that there is a greater tendency to the formation of retention cysts—

FIG. 62.—Mucous polypi of the cervix.

Nabothian follicles—owing to the mouths of the glands becoming obstructed. In some cases, these follicles force their way through the layer of cervical tissue which separates them from the surface, to which they remain attached by pedicles, so forming mucous polypi (*v.* Fig. 62). So-called *erosions* of the cervix situated on the mucous membrane below the os externum are also very frequently present (*v.* Fig. 63). The name "erosion" gives a very false idea of the anatomical changes which are present in the

majority of cases. It is not an erosion—in the true meaning of that term—but a change in the nature of the tissues, due to their hypertrophy and hyperplasia rather than to ulceration. As a result of the irritation of the portion of cervix below the os externum, by discharge constantly flowing over it, the squamous epithelium, which normally covers it, is shed, and its place is taken

FIG. 63.—The so-called "erosion" of the cervix. (After *Kelly*.)

by a downgrowth of the cubical epithelium which lines the cervical glands. At a later stage these cervical glands proliferate, and, extending downwards, are found opening on to the altered patch of cervical mucous membrane. When seen under the microscope, the altered tissue closely resembles the structure of an adenoma, and consequently the condition is sometimes described as an adenoma of the cervix. If the glands pass inwards

perpendicularly to the surface of the cervix and are dilated, the tissue between them produces, under the microscope, a papillomatous appearance—*papillary erosion* (*v.* Fig. 64, *a*, *b*). If the mouths of several of the glands become obstructed, leading to the formation of numerous small retention cysts, the condition is known as a *follicular erosion* (*v.* Fig. 64, *c*). When the formation of follicles is associated with marked hypertrophy of the cervical

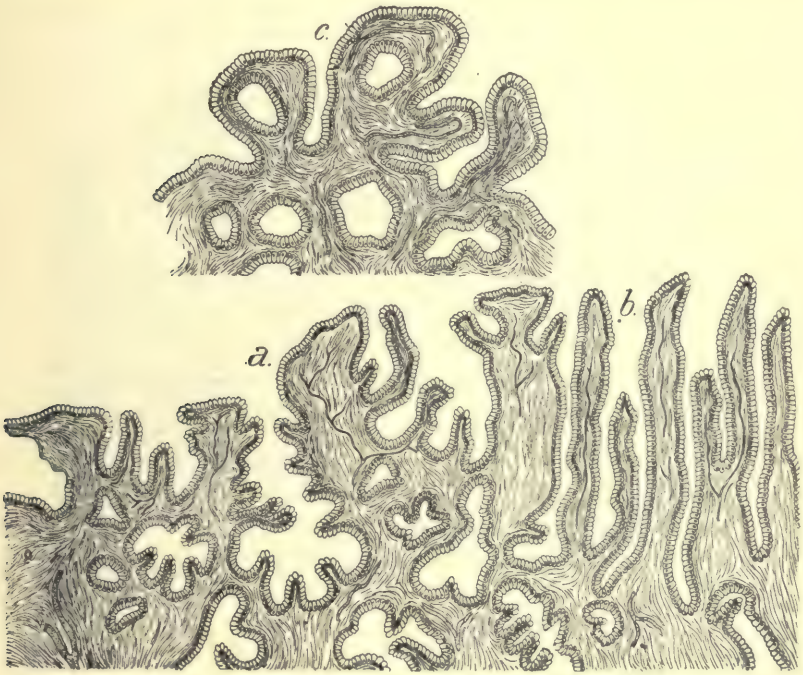


FIG. 64.—Diagrammatic sections through the so-called "erosions" of the cervix. *a*, *b*. Papillary erosion. *c*. Follicular erosion. Slightly enlarged. (*Pozzi.*)

tissue, the condition is known as Virchow's *follicular hypertrophy of the cervix*. The growth thus formed may be so large as to reach the vulvar orifice. Occasionally, in very chronic cases, the layer of cubical epithelium which covers the so-called erosion is destroyed, and thus a true erosion or ulceration occurs (Dührssen). Such a condition is commonly met with in cases of long-standing prolapse of the cervix. A mucous polypus resembles, in its microscopical appearance, the tissue found in

an erosion, save that the glands are more dilated, and in some cases are even altered into cystic cavities (*v.* Fig. 65).

Ectropion of the cervix is a very common cause of endocervicitis, and is frequently confused with erosion. Ectropion is the term applied to the exposure of the cervical canal which results from deep laceration of the cervix, and the growth of endocervical mucous membrane over the torn surface (*v.* Fig. 116). Its appearance closely resembles that of an erosion, as, in both,

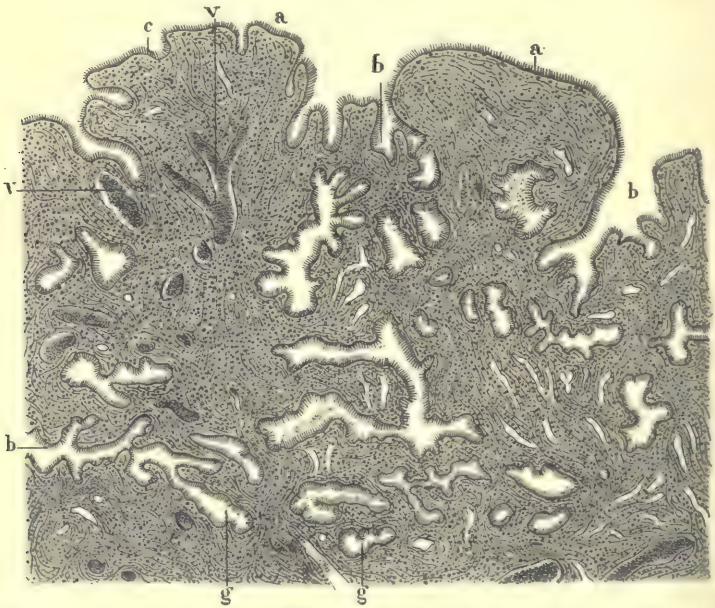


FIG. 65.—Glandular, or mucous, polypus of the cervix. Sections enlarged about 60 diameters. *a*, *a*. Superficial elevations on surface of polypus, covered by cylindrical epithelium. *b*. Depression between elevations, into which glands are opening. *g*. Deeper portions of glands. *v*, *v*. Blood-vessels. (*Cornil.*)

the lowest portion of the cervix is composed of hypertrophic and hyperplastic endocervical mucous membrane. In an erosion, this tissue extends beyond the os externum and invades the squamous mucous membrane covering the outer surface of the cervix. In an ectropion, it does not extend beyond the limits of the os externum and of the cervical laceration. It is obvious, however, that the two conditions can, and often do, co-exist.

Symptoms.—The cervix is enlarged and gaping, and a thick purulent or muco-purulent discharge issues from it. A papillary

erosion imparts a curious velvety sensation to the fingers; a follicular erosion gives a sensation as if small grains of shot lay beneath the mucous membrane. If any of the follicles have become pedunculated, they may be felt protruding from the os. An ectropion is distinguished from an erosion by seizing the lips of the cervix in a bullet forceps, and bringing them together in such a manner as to restore the original shape. If the condition is one of ectropion alone, the inflamed cervical lining will disappear. If, however, it is an erosion, the altered patch of mucous membrane will still be visible. The subjective symptoms are similar to those of endometritis, save that menstrual disturbances may be absent, but as a rule there is a more profuse leucorrhœa.

Treatment.—The treatment of these cases consists in the cure of accompanying endometritis and vaginitis, in the removal of erosions, in the suture of cervical lacerations, and in the curetting and cauterisation of the cervical canal. It is sometimes thought advisable to attempt to cure erosions by means of the frequent application of caustics, but this is a most tedious process if there is much glandular proliferation. Occasionally, one meets with cases which respond rapidly to the application of caustic, and in which one can see from week to week the gradual ingrowth of the squamous mucous membrane. In these cases, it is probable that there is little or no glandular hyperplasia, and that the altered appearance of the cervical mucous membrane is due to congestion and to the washing away of the superficial layer of squamous epithelium. The best caustic in these cases is perhaps pure liquid carbolic acid. In some cases, erosion and ectropion will get well of themselves after a long time, a result which is brought about by the gradual atrophy of the glands, and the accompanying ingrowth of the compound squamous epithelium over the denuded area. In all cases of large erosions or great hypertrophy of the cervix, a much more rapid cure will be obtained by amputation of the cervix by Simon-Marckwald's method (*v.* page 389), or by excision of the cervical mucous membrane by Schroeder's method (*v.* page 386). In the case of extensive lacerations, trachelorrhaphy by Emmet's or Sänger's method is the most suitable form of treatment (*v.* pages 391, 389).

CHAPTER IX.

DISEASES OF THE UTERUS (*continued*).

New Growths of the Uterus—Myomata; Ætiology, Pathological Anatomy, Secondary Changes, Symptoms, Diagnosis, Prognosis, Treatment—Malignant Neoplasms: Carcinoma of the Body; Pathological Anatomy, Symptoms, Diagnosis, Prognosis. Treatment: Carcinoma of the Cervix; Pathological Anatomy, Symptoms, Prognosis, Treatment: Sarcoma; Varieties, Pathological Anatomy, Symptoms, Diagnosis, Prognosis, Treatment: Endothelioma; Pathological Anatomy, Diagnosis, Treatment: Chorion-Epithelioma; Ætiology, Pathological Anatomy, Symptoms, Diagnosis, Treatment—Tuberculosis of the Uterus; Varieties, Diagnosis, Treatment.

BENIGN NEOPLASMS OF THE UTERUS.

The benign neoplasms which are met with in the uterus are as follows:—

(1) Fibro-myomata.

(2) Adenomata.

(3) Fibro-adenomata or adeno-fibromyomata.

Fibro-myomata are so important as to require a section to themselves. Adenomata have been already described under glandular endometritis (*v.* page 135). It is very questionable whether this condition should be considered as a neoplasm, or as merely the result of inflammatory changes. For this reason, we prefer to discuss it under the head of metritis.

Fibro-adenomata, or adeno-fibromyomata as they are more correctly called, occur when glandular development takes place in a fibro-myoma. The origin of the glandular tissue may be either pre-existing uterine glands which have made their way into the interior of a fibro-myoma (Legieu), or the remains of aberrant portions of the Wolffian bodies (Recklinghausen) (*v.* Fig. 69).

Fibro-Myomata.

Fibro-myomata, or myomata (μῦς, a muscle), or uterine fibroids, as they are variously called, are the most important of the benign uterine neoplasms.

Ætiology.—Any discussion on the ætiology of myomata involves the consideration of tumour formation in general, and therefore is

FIG. 66.—Section through an interstitial myoma, springing from the fundus. 1. Main mass of the myoma. 2. Capsule formed by thinned-out uterine wall and peritoneum, and containing dilated veins. 3. Cavity of uterus. 4. Cervix. 5, 5. Enlarged and œdematous ovaries. 6. Fallopian tube. (*Roberts.*)

out of place in a work of this kind. The question, why these tumours should occur relatively so much more frequently in the uterus, than in other organs containing involuntary muscle fibre, is of extreme gynæcological interest, but, unfortunately, the

answer cannot as yet be given. All that can be said is that the uterus contains the largest and densest mass of involuntary muscle in the body, and that it is the only muscle of the kind which physiologically possesses enormous powers of developement and increase. Moreover, myomata as a rule usually start in women who either have not had children, or who have passed a considerable number of years during the child-bearing period without becoming pregnant. These two facts are suggestive, and, reasoning from them, it may be held, not illogically, that the frequency of these tumours is due to an abnormal hyperplasia

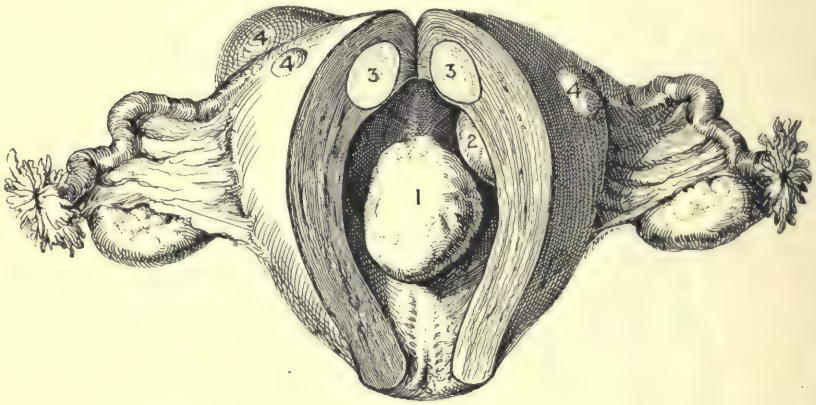


FIG. 67.—Uterus showing the various positions in which myomata may develop. 1. Pedunculated submucous myoma. 2. Sessile submucous myoma. 3. Interstitial myoma. 4. Subperitoneal myomata. (From a specimen in the possession of Dr. H. C. Earl.)

which the uterine muscle undergoes as a result of being deprived of the normal hyperplasia which would result from pregnancy.

Pathological Anatomy.—A uterine fibro-myoma is composed of both unstriped muscle cells and fibrous tissue (*v.* Fig. 69). In some tumours the fibrous tissue predominates, in others the muscular. Myomata are more or less circular in form, on section present a whorled appearance, and vary in size from that of a pea to that of a nine months' pregnancy. They are usually multiple, and they tend to grow in one of the following ways (*v.* Fig. 67):—

(1) Outwards into the uterine cavity,—submucous myoma.

(2) Inwards into the abdominal cavity,—subserous or subperitoneal myoma.

(3) Between the layers of the uterine wall, so that there is a covering of normal uterine tissue between the myoma and the surface,—interstitial myoma.

An interstitial myoma may grow outwards or inwards so as to become either submucous or subperitoneal, and a submucous or subperitoneal myoma may become pedunculated.

Secondary Changes.—The following changes may take place in myomata.

(1) Necrosis.—Necrosis, or death, of the tumour occurs in consequence of a total deprivation of the blood supply. Such a change is most likely to occur in pedunculated tumours owing to obstruction of the vessels in the pedicle by twisting or other form of compression. It may also occur in a sessile myoma as a result of complete calcification of the capsule, or, after parturition, as a result of long-continued compression. If putrefactive bacteria gain access to such necrosed tumours, sloughing occurs. According to Noble, necrosis occurs in 4·7 per cent. of all cases.

(2) Fatty degeneration.—This change occurs, in all probability, as a result of a diminution in the blood supply of the tumour, and results in the marked lessening and sometimes, it is said, even in the entire disappearance of the tumour. It most frequently occurs after parturition, and, if the uterine cavity is infected, there is considerable danger of sloughing of the myoma in consequence of the diminished blood-supply. It occurs in about 0·3 per cent. of all cases (Noble).

(3) Myxomatous degeneration. — So called myxomatous degeneration and œdema of the tumour are very closely associated. According to Haultain, interference with the lymph return leads to a serous infiltration or chronic œdema of the tissues, and this results later in a simple degeneration of a myxomatous nature. In a typical case, first the whole tumour becomes water-logged, and, later, cavities form and enlarge into cysts. The fluid consists of serum-albumin and fibrin, with more or less mucin, blood, and detritus from degenerated tissue. In some cases, an active connective tissue cell proliferation may also occur, and result in the formation of a condition resembling myxo-sarcoma. Myxomatous degeneration occurs in about 3·4 per cent. of all cases (Noble).

(4) Cystic degeneration.—In some cases, owing to various

causes, the tumour becomes cystic, and is then known as a fibro-cystic tumour of the uterus (*v.* Fig. 68). This change occurs in about 2·5 per cent. of all cases (Noble), and may be brought about as follows:—

(*a*) The tumour may undergo a myxomatous degeneration, as we have already described. This results in the formation of

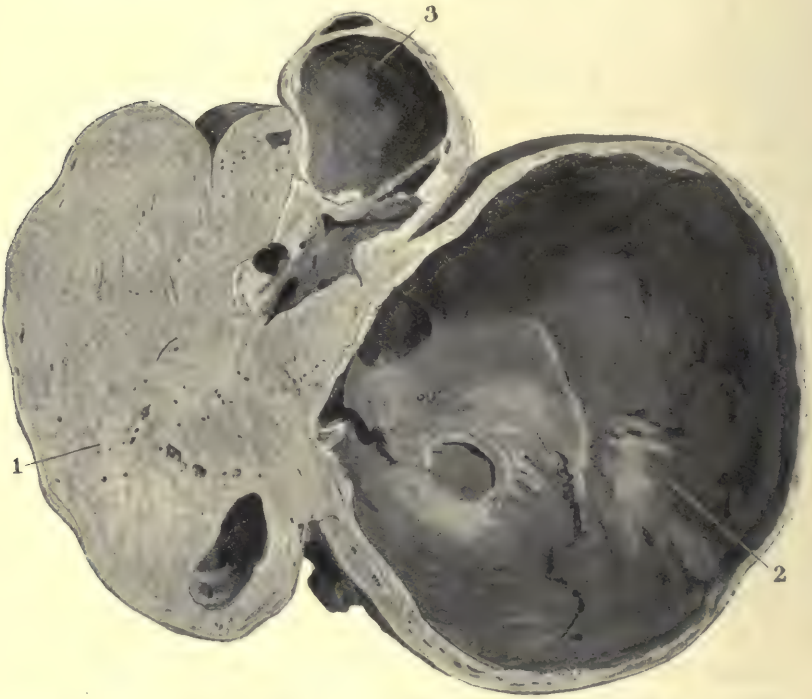


FIG. 68.—Fibro-cystic tumour of the uterus. 1. Solid portion of the tumour, showing a few cystic spaces. 2. Large cystic cavity, measuring seven inches in diameter; it has no distinct lining membrane; its outer surface is covered with peritoneum. 3. Another cystic cavity of a similar nature. (*Roberts.*)

numerous small dilatations between the bundles of muscle-fibres. These dilatations are filled with a mucin-containing fluid, and gradually tend to get larger as more of the surrounding tissue breaks down. They do not possess any definite endothelial lining. Finally, one or more large cavities are formed, which occupy almost the entire interior of the myoma.

(*b*) Occasionally the lymph vessels of the tumour may dilate, without any transudation taking place into the surrounding tissues,

with the result that cavities form, lined with endothelium and filled with lymph.

(*c*) There may be present in the uterine wall the remains of a Wolffian body (Recklinghausen), or invaginations of the uterine glands, which have been dragged downwards into the myoma in the course of its growth (Legieu), and these may become cystic. In such cases, the resultant cavities are lined

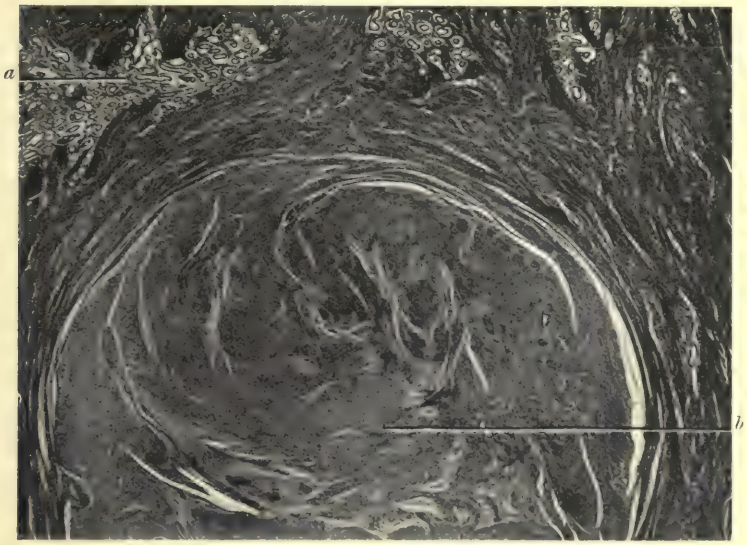


FIG. 69.—Adeno-myoma of uterus. *a*. Adenomatous growth in uterine wall. *b*. Nodular fibro-myoma. (*Wigham.*)

with epithelium. This condition would be more correctly described as cystic adeno-fibromyoma (Fig. 69, *a*).

(*d*) Myomata which have undergone sarcomatous degeneration may become cystic in the centre, as a result of necrosis from diminished blood-supply.

(5) Calcareous degeneration.—This change consists in the deposit of lime salts in the tumour. Usually these salts are first deposited in the centre and travel outwards concentrically; more rarely, the salts are deposited at first in the capsule. If the myoma which is so affected is pedunculated, it may become detached and set free, in the abdominal cavity if it is a subserous myoma, or in the uterine cavity if it is a submucous myoma. If the entire capsule is calcified, the blood-supply of the tumour is

shut off, and the latter becomes necrotic. In the case from which the drawing was made (*v.* Fig. 70), a calcified myoma ulcerated

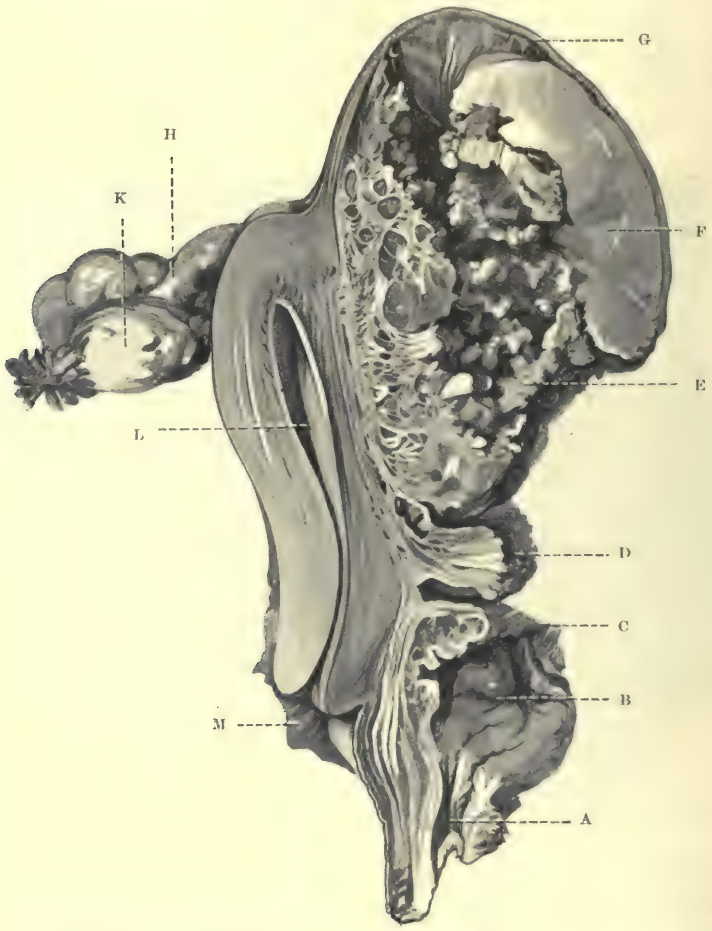


FIG. 70.—Calcareous degeneration of a sub-peritoneal myoma. A. Urethra. B. Bladder. C. Edge of gap, result of ulceration in bladder-wall. D. Edge of gap in capsule of myoma, also the result of ulceration. E. Calcified masses in centre of myoma. F. Non-calcified remains of myoma. G. Capsule. H. Fallopian tube. K. Ovary. L. Uterine cavity. M. Vagina. (From a specimen in the School of Physic, Trinity College, Dublin.)

through the bladder wall. Part of the calcified portion broke off, and falling into the bladder led to the diagnosis of calculus of the bladder—the uterine condition being overlooked. Calcareous degeneration occurs in about 1·7 per cent. of all cases (Noble).

(6) Angeomatous degeneration.—In some cases the vessels of the myoma undergo a marked increase in number and size, so that the structure of the tumour resembles that of a sponge. These tumours are known as *cavernous* or *telangiectatic myomata* (Virchow). This change occurs in about 1·5 per cent. of all cases.

(7) Red degeneration.—This change consists in a necrosis of

FIG. 71.—Fibro-myoma of the uterus, associated with adeno-carcinoma of the endometrium. A. Large sub-peritoneal myoma, on posterior wall of uterus. B. Interstitial myoma. C. Papillomatous malignant outgrowths springing from, D, posterior wall of uterine cavity. (From a specimen removed by the author.)

the tissue of the tumour accompanied by a diffuse red staining. The degree of staining varies considerably, in some cases being merely a pink coloration, in others being so marked as to make a section of the tumour resemble raw beef-steak. The change is most commonly associated with pregnancy, and is probably due to the sudden cutting-off by pressure of a rich blood supply; the contained blood becomes laked, and the hæmoglobin thereupon stains the tissues. Red degeneration is probably an uncommon

phenomenon, though its minor degrees are liable to be overlooked.

(8) Malignant degeneration.—Sarcomatous degeneration is not of very uncommon occurrence, and is a possibility which must be remembered when discussing the advisability of operative interference. It is a change which takes place very insidiously, and, when it is diagnosed, it is usually too late to remove the tumour completely. Carcinomatous degeneration is very much more rare than sarcomatous, inasmuch as it is probably only in a small proportion of cases that the pre-existing epithelium, which is necessary for the development of the carcinoma, is found in a myoma. In these cases, the starting point of carcinoma is probably the same as the starting point of fibro-adenoma of the uterus, viz., the remains of a Wolffian body, or portions of included uterine glands. Secondary involvement of a myoma, by carcinoma starting in the endometrium, is, on the other hand, by no means an uncommon occurrence. A typical example of the manner in which such a condition commences is shown in the accompanying drawing (*v.* Fig. 71).

Symptoms.—The symptoms caused by myomata are a varying degree of menorrhagia, metrorrhagia, leucorrhœa, dysmenorrhœa, and pain. Symptoms produced by the pressure of the tumour on the pelvic and abdominal viscera are also usually present.

It will be easily understood that the extent to which these symptoms occur varies greatly in different cases. Speaking generally, they may be said to depend upon the following points:—

(1) The situation of the tumour, *i.e.*, whether it is subperitoneal, interstitial, or submucous.
(2) The condition of the endometrium.
(3) The size of the tumour.
(4) The age of the patient.
(5) The changes which the tumour is undergoing.

(1) *The Situation of the Tumour.*—The situation of the tumour affects to a marked degree the amount of menorrhagia and metrorrhagia, leucorrhœa and dysmenorrhœa—that is, the various symptoms of endometritis—which occur in any case, as these symptoms to a large extent depend on the proximity of the myoma to the endometrium. These symptoms are most marked

in submucous myomata, and least marked in pedunculated subperitoneal myomata.

(2) *The Condition of the Endometrium.*—The condition of the endometrium has naturally a marked effect on the amount of hæmorrhage. Endometritis is usually present in cases of myomata, and, according to its degree, the hæmorrhage is profuse and constant or slight and occasional.

(3) *The Size of the Tumour.*—The size of the tumour also affects the amount of hæmorrhage, unless the entire growth is subperitoneal. In all cases, a myoma causes pressure symptoms in proportion to its size and situation, and, if it should become impacted in the pelvis, these symptoms will be very acute. If the tumour reaches an extreme size, intestinal atony may result from pressure on the intestines, and cardiac distress and dyspnœa may result from pressure upon the heart.

(4) *The Age of the Patient.*—The symptoms of a myoma, in so far as they are dependent on the blood-supply of the tumour, tend to diminish at the onset of the menopause, because the uterine blood-supply begins to lessen. In some cases, the diminution may be so great that the patient returns to comparative health, whilst in others the change is scarcely noticeable. Too much importance has in the past been attached to the possibility of this improvement occurring, and many women have been allowed to remain invalids for years in the hope that the onset of the menopause would bring relief. Now, however, it is becoming very widely recognised that in the majority of cases such a hope is illusory, and that only in cases of very small myomata can any improvement be expected. All the symptoms become worse at the onset of and during a menstrual period.

(5) *The Changes which the Tumour is undergoing.*—The changes which the tumour undergoes have in some cases a marked effect upon the nature and amount of the uterine discharges. Thus, if calcification occurs, hæmorrhage and leucorrhœa are lessened. In fatty degeneration, hæmorrhage is also lessened, and though at first there is an increase in the leucorrhœa, which contains fat-drops, after a time this discharge will also be diminished. In malignant degeneration, the discharge is at first profuse, and at intervals there may be severe hæmorrhages. As soon as the malignant growth becomes infected by saprophytic or septic bacteria, the discharge becomes sanious.

If sloughing occurs, there is also a sanious discharge, and, if there is suppuration, pus escapes.

Diagnosis.—The diagnosis of a myoma may be a very simple procedure, or, on the other hand, it may be a matter of the greatest difficulty; or it may even be impossible, without the aid of an exploratory laparotomy. The main points on which we depend in making a diagnosis are as follows:—

(1) The existence of a tumour usually multinodular, incorporated in or connected with the uterus.

(2) The palpation of both ovaries as bodies separate from the tumour.

(3) The elimination of the possibility of pregnancy as a cause of the uterine enlargement.

(4) In the case of submucous myomata, the projection of a tumour into the interior of the uterus, as determined by the sound or by digital exploration of the uterine cavity.

(5) The history of the gradual growth of a tumour upwards from the pelvis, accompanied by menstrual disturbances as described above.

In a typical case, on making a bimanual examination, a multinodular tumour will be found, in which the uterus is incorporated, and which moves when the cervix is pulled upon. The ovaries are felt lying alongside the tumour, and possibly their connection with it may be determined. The tumour may be freely moveable, or on the other hand it may be firmly fixed as a result of its impaction in the pelvis. In the case of a submucous or interstitial myoma, the uterus may preserve its shape, while at the same time it is enlarged to a varying extent. Such cases are readily confused with pregnancy, or, if the enlargement is but slight, with chronic corporeal myo-metritis. The diagnosis from pregnancy is made principally by the history of the patient, and by the character of the enlargement. In pregnancy, the uterus is softer, especially the lower uterine segment; the body is more globular; it may be possible to obtain internal ballottement; and, when the sixth month is passed, it is possible to obtain the certain signs of pregnancy, *i.e.*, to auscultate the fœtal heart and to palpate the fœtal parts.

A myomatous uterus must also be distinguished from ovarian tumours, enlargement of the Fallopian tubes, extra-uterine pregnancy, a large retro-uterine hæmatocele, splenic and renal

tumours, and malignant growths which have extended into the pelvis from any abdominal organ. A myoma, such as that shown in the accompanying drawing (*v.* Fig. 72), can be readily mistaken for an ovarian tumour, cystic tubes, or a hæmatocele in Douglas' pouch, or for the body of an enlarged retroverted uterus.

Having made the diagnosis of the presence of a myoma, its situation must be determined as accurately as possible, as the question of the proper mode of treatment will to a great extent depend upon this.

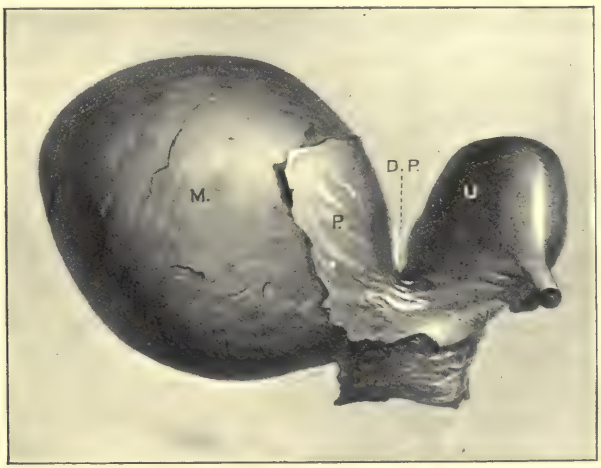


FIG. 72.—A subperitoneal myoma springing from the posterior cervical wall, and lying behind the peritoneum, which forms the posterior wall of Douglas' pouch. U. Uterus. D. P. Douglas' pouch. P. Peritoneum. M. Myoma springing from cervix. (From a specimen in the possession of Dr. Earl.)

Prognosis.—The prognosis, and hence the treatment of myomata, depend upon conditions very similar to those which influence the symptoms, *i.e.*, the situation and size of the tumour, the changes which may take place or are taking place in it, and the age of the patient. Myomata may cause death by the continued loss of blood; by the debilitating effect of profuse leucorrhœal discharge; by the pressure they exert upon vital organs; or by forming the starting point of malignant growths. On the other hand, subperitoneal, and sometimes interstitial, myomata of quite small size, which do not cause any symptoms, and do not increase in size, may as a general rule be considered to be harmless.

Treatment.—The treatment of myomata is somewhat complex, as so much depends upon the nature and circumstances of each individual case. The various measures which are adopted will be best considered under two heads :—

I. Palliative treatment—that is, the adoption of measures directed towards the relief of the symptoms and the checking of the growth of the tumour.

II. Radical treatment—that is, the removal of the myoma either with, or without, the removal of the uterus.

I. Palliative Treatment.—We cannot recommend at the present time the palliative treatment of myomata, since, whatever opinions may be held as to the advisability, or otherwise, of removing a myoma whenever its presence is discovered, there is little doubt that if it is causing such symptoms as to necessitate treatment, its removal is indicated. Palliative measures are, however, interesting as showing the gradual evolution of modern treatment, and, furthermore, are sometimes of value as temporary measures when the circumstances of the case render operation for the time being impossible. Palliative measures, directed towards the relief of the symptoms and the checking of the growth of the tumour, can be divided into the following classes :—

(A) Medicinal measures.

(B) Operative measures.

(A) **Medicinal Measures.**—Medicinal measures consist in the free use of such drugs as Ergot, Hydrastis Canadensis and Cannabis Indica, and of electricity.

The continued use of ergot was introduced by Hildebrandt, who recommended the injection of ergotin (Ext. Ergotæ, B.P.). He used the small amount of five centigrammes (·78 gr.) diluted with four times its weight in water, a dose which may with advantage be increased to two to four grains. Any good preparation of Liquid Extract of Ergot may be used instead, the dose consisting of from twenty to thirty minims at each injection. Ergot will probably tend to limit the blood supply of the uterus, and so to check the hæmorrhage and the growth of the tumour in some cases, but it is most uncertain and unsatisfactory in its action. The Liquid Extract of Hydrastis Canadensis is administered in doses of from ten to fifteen minims three times a day, and the

Tincture of Cannabis Indica is administered in doses of from five to fifteen minims.

The use of the continuous electrical current, as a means of causing the absorption of myomata, was first brought prominently forward by Apostoli in 1886. His method consisted in subjecting the tumour to the influence of a continuous current, by placing the positive electrode of a battery in the uterus, and the negative electrode upon the abdominal wall over the tumour. The intra-uterine electrode was made in the shape of a sound, in order to facilitate its introduction. The abdominal electrode consisted of a large flat pad, in order that there might be a considerable area of contact between it and the skin, as in this way the irritation and pain caused by the passage of the current was diminished. On the first occasion, the current was gradually increased in intensity up to 50 to 80 milliampères, kept at this quantity for five minutes, and then gradually reduced. The treatment was repeated once or twice a week, and the maximum strength of the current gradually increased up to 200 m.a. If the treatment produced a beneficial effect, we were recommended to continue it for several months; on the other hand, it was admitted that it was useless to persist with it for an unduly long time if there was no apparent benefit.

The use of electricity has in some cases caused temporary benefit. In the majority of cases, however, its result is not by any means satisfactory. It is, to say the best for it, an uncertain mode of treatment, which should only be adopted in exceptional cases, such as in women who are approaching the menopause, who will not submit to a radical operation, or in whom such a proceeding is contra-indicated.

(B) **Operative Measures.**—The operations of curetting and oöphorectomy have been sometimes performed as palliative measures for the relief of myomata.

The practice of curetting in myomata was introduced by Winckel. Its effect is to remove the diseased endometrium, which commonly is present in association with myomata, and in this way, in some cases, it brings about a temporary relief of the symptoms. This relief will be of longer or shorter duration according as the myoma is subserous or close to the endometrium. In the latter case, the benefit is extremely transitory. Curetting is often of value as a preliminary to a more radical operation, by

removing an endometrium which may be in a sloughing or otherwise septic condition.

Double oöphorectomy, with the object of hastening the advent of the menopause, was introduced by Battey. It used to be considered the operation of election in myoma, but, since the perfecting of the technique of hysterectomy, it has been abandoned. This is due not only to the fact that the relief it affords is both incomplete and uncertain, but also to the knowledge that a woman with her uterus and no ovaries suffers more after the operation, both mentally and physically, than a woman who has her ovaries and no uterus. The modern gynæcologist, so far from wishing to remove the ovaries and to leave the uterus, desires, if operation is necessary, to remove the uterus and to leave the ovaries.

II. Radical Treatment.—Operations for the removal of myomata fall under two heads:—

(1) Those involving the removal of both the uterus and the myoma.

(2) Those involving the removal of the myoma alone.

(1) Hysterectomy is the operation most frequently performed in the case of large myomata. The different methods of performing it may be tabulated in the following manner:—

- Hysterectomy
  - Ventral
    - Partial.
    - Total.
  - Vaginal
    - Without mutilation of the uterus.
    - With mutilation of the uterus.

The nature of these various operations will be discussed in the proper place (*v.* page 411). For our present purpose, the terms by which they are known will convey sufficient information.

The form of hysterectomy, which is chosen in any particular case, depends upon the size and position of the tumour. Partial ventral hysterectomy, that is removal of the body of the uterus alone, is suitable in those cases in which the low situation of the tumour does not prevent the isolation and retention of the cervix. Total ventral hysterectomy rivals partial hysterectomy as the operation of election for large myomata. Whether it is the better operation or not for all cases, it has at all events firmly established its place for those cases in which it is not possible

to isolate a cervix suitable for ligation. Further advantages claimed for it are that the cervix is removed, and hence a possible source of infection of the peritoneal cavity avoided, and that there is not as much risk of secondary hæmorrhage as there is after partial hysterectomy. Its disadvantage is that in some cases it takes slightly longer to perform than does the latter operation. Vaginal hysterectomy without mutilation of the uterus—that is, without any preliminary reduction in the size of the uterus—is rarely possible in the case of a myomatous uterus, owing to want of room (*v.* page 456). Vaginal hysterectomy with mutilation of the uterus may be performed in the case of small myomata which do not extend above the pelvic brim.

(2) Operations for the removal of the myoma alone fall under one of two headings;—myomectomy, or enucleation. By myomectomy is meant the excision of a pedunculated myoma by cutting across the pedicle, and by enucleation the shelling out of a sessile or interstitial myoma. These operations are so closely related to one another that they may be considered together. Each of them can be performed as an abdominal or as a vaginal operation, and hence they are classified as :—

(*a*) Ventral myomectomy and enucleation.

(*b*) Vaginal myomectomy and enucleation.

(*a*) *Ventral Myomectomy and Enucleation.*—Ventral myomectomy is the most suitable operation in the case of a pedunculated subperitoneal myoma, ventral enucleation in the case of a non-pedunculated subperitoneal or interstitial myoma which can be removed without permanent injury to the uterus (*v.* page 459).

Enucleation is certainly the ideal operation for those cases in which the myomata are small, and single or few in number, and do not involve a large extent of the uterus, as it leaves the latter intact. Its disadvantages are that it is sometimes difficult to check the hæmorrhage which results from the tearing of the capsule, and that, if the uterus is not aseptic, infection may occur of the cavity left after removal of the tumour.

(*b*) *Vaginal Myomectomy and Enucleation.*—Vaginal myomectomy and enucleation is always indicated when pedunculated or sessile submucous myomata protrude into the uterine cavity, and also in the case of such small subperitoneal myomata as can be easily reached from the vagina through the anterior or posterior fornix (*v.* pages 403, 459).

Pedunculated submucous myomata, or "fibrous polypi," which have been expelled from the uterine cavity, are very much the easiest to manage by this method. In their case, it is only necessary to seize the polypus with a strong forceps and to twist it gradually away if the pedicle is thin, or, if the latter is very thick, to divide it with scissors after first tying it. If there is any difficulty in checking the hæmorrhage, the uterus must be firmly plugged with gauze.

Sessile submucous myomata, or polypi which have not been expelled from the uterus, can be removed in one of two ways. Either the cervix may be dilated by means of sea-tangle tents and Hegar's dilators (*v.* page 15), or the anterior wall of the uterus may be split—after first separating the bladder as in a vaginal cœliotomy, the tumour enucleated, and the incision sutured. If the tumour is of large size, it may be necessary to remove it piecemeal—so called morcellation (*v.* page 457). In the vaginal removal of subserous myomata, the anterior or posterior fornix is opened according as the tumour is growing from the anterior or posterior wall of the uterus, then the capsule of the myoma is incised, the myoma itself enucleated, and the cavity sewn up.

As we have now mentioned the different methods of treating myomata of the uterus, we must go on to discuss briefly the rules which ought to guide us in deciding upon the proper course to adopt in any given case. There is one general principle which applies to all cases, and this is never to remove more than is necessary. If the tumour can be removed alone and the uterus left intact, we should only remove the tumour. If it is necessary to remove the uterus also, and the ovaries are healthy, the latter must always be left. Only when the ovaries are diseased, or when the situation of the tumour makes it impossible to leave them behind, should both ovaries and uterus be removed. Accordingly, in all cases in which myomectomy or enucleation is possible, one or other or both should be performed. If the tumour is projecting into the uterine cavity, it should be removed by the vagina; if it cannot be conveniently removed by this route, the abdominal route must be followed. If neither myomectomy nor enucleation can be performed, then hysterectomy becomes necessary.

Hysterectomy can be performed by the abdominal or the vaginal route. The former is always the easier and quicker, save in the

case of small tumours, and, as the technique of abdominal surgery has so greatly improved, and its risks so much diminished, this route is now adopted by most gynæcologists in nearly all cases.

We have seen that abdominal hysterectomy may be either partial, in which the cervix is left, or total, in which the entire uterus is removed. If partial hysterectomy is to be performed, then Kelly's hystero-myomectomy is the operation which we find most suitable, and, if complete hysterectomy is to be performed, then Doyen's operation is most suitable. Opinions differ as to which is the operation of choice, some operators preferring complete hysterectomy in all cases, and others only performing it when there is some definite reason for removing the cervix. We, personally, regard partial hysterectomy as the operation of choice, and do not remove the cervix unless the mode of growth of the tumour renders its retention difficult, or there is any infection of the uterine cavity or of the appendages, or suspicion of malignant disease.

An important reason for preserving the cervix, and one which is often overlooked, is to be found in the fact that in many cases its preservation enables us to preserve also the uterine attachments of the sacro-uterine ligaments. The vault of the vagina receives a marked degree of support from these ligaments, and, if that support is lost, it tends to sink downwards. If the pelvic floor is strong, this is not a matter of much consequence, but if the pelvic floor is relaxed, loss of the ligaments may be a matter of considerable importance, and may favour the occurrence of subsequent vaginal prolapse.

MALIGNANT NEOPLASMS OF THE UTERUS.

The malignant neoplasms, which are met with in the uterus, are as follows :—

I. Carcinoma.
II. Sarcoma.
III. Endothelioma.
IV. Chorion-epithelioma.

Carcinoma of the Uterus.

Cylindrical-celled cancer or adeno-carcinoma may start in the uterine or in the cervical glands. Squamous-celled cancer

can only arise outside the os externum, that is in that portion of the cervix which is covered with compound squamous epithelium. We shall discuss cancer of the body and of the cervix separately.

Carcinoma of the Body.—Cancer of the body is always cylindrical-celled, save in the exceptional cases in which it is secondary to a pre-existing growth in the cervix. It is a comparatively rare disease, and occurs usually in women between the ages of fifty and sixty, and more frequently in nulliparous than

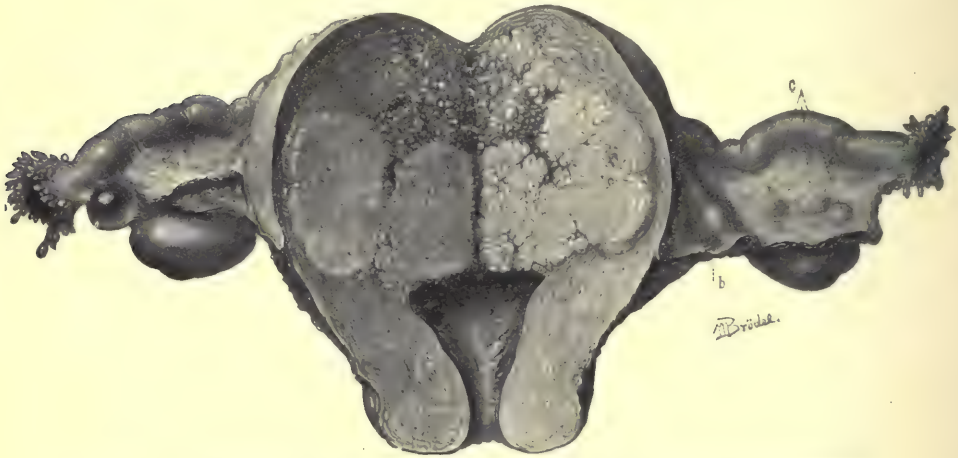


Fig. 73.—Adeno-carcinoma of body of uterus. *b*. Nodule in left round ligament. *c*. Three small nodules in lymph channels of left broad ligament. (*Cullen.*)

in parous women. It is not infrequently associated with myomata of the uterus.

Pathological Anatomy.—The growth starts from the cylindrical epithelium of the uterine glands, and is in fact an adeno-carcinoma. It then continues to develop in one of two ways;—as a circumscribed growth, or as a diffuse growth. The circumscribed form is the rarer of the two. In it, a tumour—sessile or slightly pedunculated—is found springing from some portion of the uterine wall, while the remainder of the mucous membrane is quite unaffected. In the diffuse form the disease involves all, or the greater part of, the endometrium, and then spreads outwards into the muscular coat (*v.* Fig. 73). As the growth of the disease continues, the entire body of the uterus becomes affected,

but, so far as is at present known, extension never takes place into the cervix, doubtless because the lymph stream flows from the cervix in the direction of the body. Extension takes place into the broad ligaments, and subperitoneally all round the uterus; and, finally, any of the neighbouring organs may be involved, and metastases may occur in the lungs and liver.

Symptoms.—The earliest symptom of cancer of the body of the uterus is the occurrence of a watery and blood-stained discharge, which very quickly becomes sanious, owing to the infection of necrotic tissue by saprophytic organisms. At the same time, there is constant pain resembling that caused by metritis. As the growth spreads, the discharge increases, and there may be profuse attacks of hæmorrhage owing to ulceration of the walls of a vessel. The pain also increases as the trunks of the sacral nerves become involved. If there is much sloughing, the patient may have the symptoms of septic absorption, and the infection may travel to the peritoneal cavity and cause a general peritonitis. In the last stages, the ureters may be compressed, so causing suppression of urine and consequent uræmic poisoning; and, if the lungs are involved, metastatic pneumonia will result.

Diagnosis.—Cancer of the body of the uterus in its early stages may be suspected from the foregoing symptoms, especially if they are associated with a more or less uniform enlargement of the uterus. Its existence can be confirmed by the removal, and subsequent microscopical examination, of a fragment of the endometrium. Cancer of the body may be very closely simulated, so far as the symptoms and physical signs are concerned, by a sloughing submucous myoma, and also by some of the forms of endometritis, and particularly by senile endometritis. Moreover, it is by no means uncommon for malignant disease of the endometrium to be associated with myomata, and in such cases the microscope affords the only means of diagnosis. The only condition, which may be confounded with malignant disease, even if a careful microscopical examination is made, is glandular endometritis, owing to the hyperplasia of the glands. A diagnosis can, however, always be arrived at by a competent pathologist, if the following points in the microscopical appearances of cancer are remembered:—

(1) The epithelial lining of the glands becomes multiplied, so that masses of superimposed cells are found.

(2) The basement layer of flat cells, which is found between the glandular cul-de-sacs and the connective tissue, disappears, so that the epithelial cells lie directly on the connective tissue (Cornil).

(3) The cilia of the cells are lost (Cornil).

(4) The glands extend deeply into the muscular coat of the uterus.

FIG. 74.—Carcinoma of the body of the uterus. *b*. Large clusters of epithelial cells lying in spaces between the muscular and connective tissue. *n*. Smaller cluster. *t*. Bundles of muscle or connective tissue. (*Cornil.*)

It must be most carefully remembered, that, if a permanent cure is to be obtained by operation in these cases, early diagnosis is essential, and for this a portion of the endometrium must be removed for microscopical examination in every case in which we find persistent and irregular hæmorrhages in an elderly woman. The same course must also be adopted in the case of young women where recurrent hæmorrhages do not cease after the ordinary treatment of these cases—curetting, etc.—has been tried.

Prognosis.—If the uterus is removed before the neighbouring tissues or glands are implicated, the prognosis is good. However,

unfortunately, the patient is not always seen at such an early stage. In inoperable cases, or in cases in which after operation the growth returns, death will occur from one or other of the following causes :—

(1) Uræmia from compression of the ureters.
(2) Septic absorption from the sloughing tumour.
(3) Peritonitis from the same cause.
(4) Anæmia due to long-continued hæmorrhage, or syncope from a sudden attack due to the ulceration of the walls of a blood-vessel.
(5) Intestinal obstruction due to extension of the cancer to the intestines.
(6) Secondary infection of the lungs.
(7) Simple exhaustion.

Treatment.—Radical treatment, consisting in the performance of hysterectomy, the removal of the parametric connective tissue, and, if possible, the retro-peritoneal glands, is always indicated if the disease is apparently limited to the uterus, as shown by the fact that no appreciable infiltration of the surrounding tissues or of the lymphatic glands can be felt.

Vaginal hysterectomy has been most usually adopted in these cases up to comparatively recent times. Of late, however, chiefly following the teaching of Kelly of Baltimore, ventral hysterectomy has become the operation of election. The advantages which this latter operation presents are :— that more radical measures can be taken to remove the whole of the affected tissues round the uterus, and even the infiltrated retro-peritoneal lymphatic glands ; that a large sleeve, or, if necessary, the entire upper half of the vagina can be removed with the uterus ; and that the uterus can be removed without opening its cavity, as is frequently necessary on account of its size when vaginal hysterectomy is performed. This is a point of great importance, as when the uterus is removed intact, there is not the same risk of infecting the cut edges of the wound with the malignant growth from the interior of the uterus.

If the disease is too extensive to permit of a radical operation, then temporary relief can be afforded by curetting and cauterising the interior of the uterus as recommended by Marion Sims (*v.* page 407). If this proceeding is properly carried out, a cast of the

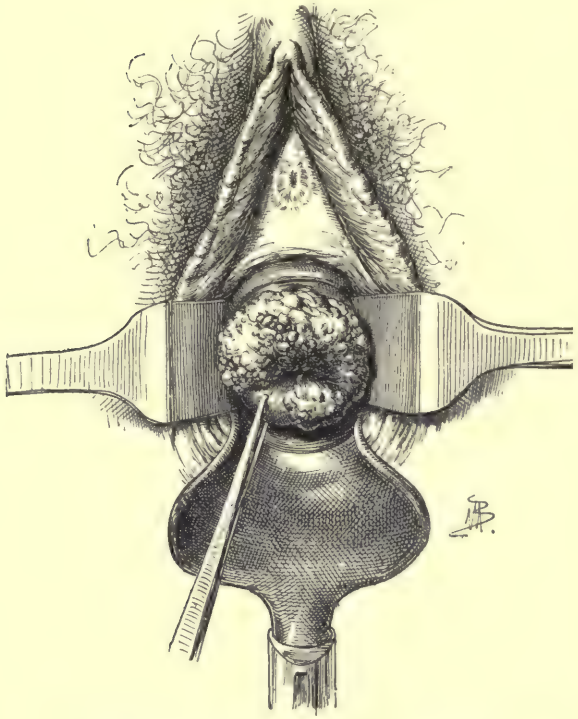


FIG. 75.—Papillary squamous-celled cancer of cervix in an early stage, seen from below. (⅔ scale.) (*Kelly.*)

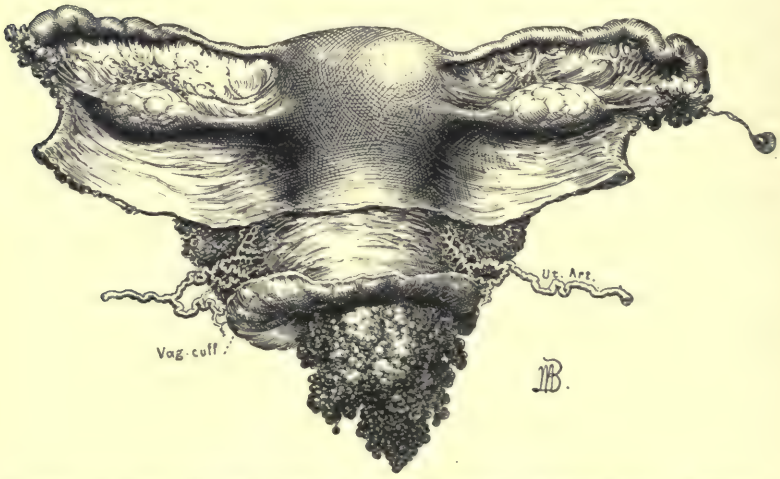


FIG. 76.—Papillary squamous-celled cancer of cervix in a more advanced stage. (½ scale.) (*Clark.*)

inside of the uterus is thrown off, and the resultant benefit to the patient caused by checking the sanious discharge, though temporary, is considerable.

CARCINOMA OF THE CERVIX.—Cancer of the cervix may be either squamous-celled, when the growth starts in the portion of the cervix which is covered by compound squamous epithelium, or cylindrical-celled, when it starts as an adeno-carcinoma from the cervical glands. It is very much more common than is cancer of the body, and may occur at any time between the ages of twenty-five and sixty. Practically, it is only met with in women who have borne children.

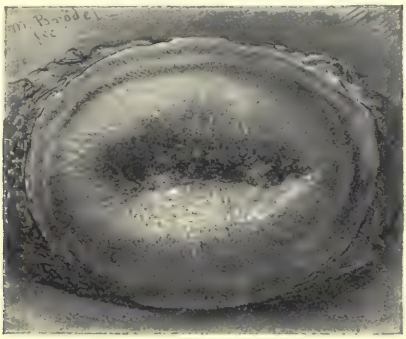


FIG. 77.—Adeno-carcinoma of the cervix, showing only slight involvement of the vaginal portion, seen from below. (Natural size.) (*Cullen.*)

Pathological Anatomy.—Clinically cancer of the cervix is met with in one of three forms:—

(1) A papillary or proliferating form, in which a warty, cauliflower-like mass is found projecting downwards into the vagina. This is usually a squamous-celled growth (*v.* Figs. 75, 76).

(2) An ulcerative form, in which the malignant growth, starting in the cervical canal, has extended outwards into the cervical and paracervical tissue, without invading the external mucous membrane (*v.* Fig. 77). In the later stages the mucous membrane becomes involved, and the entire cervix is eaten away, so that on passing a finger into the vagina a large cavity is found at the top, resembling an inverted crater (*v.* Fig. 78). This may be either a squamous or cylindrical-celled growth.

(3) A nodular form, in which the disease starts as one or more

small kernel-like masses in the cervical tissue (*v.* Fig. 79). As these masses come to the surface and increase in size, the

FIG. 78.—Squamous-cell cancer of the cervix with extension to the vagina, showing extensive ulceration of the cervix tissue. (Natural size.) (*Cullen.*)

nodular condition disappears and a papillary-like mass is formed. This is usually a cylindrical-celled growth.

Although it is usually considered that cancer of the cervix never extends into the uterus, still, isolated cases have been recorded in which nodules of squamous-celled cancer have

FIG. 79.—Adeno-carcinoma of the cervix, showing nodular masses in the cervical tissue, and only slight involvement of the mucous membrane of the vaginal portion of the cervix. (Natural size.) (*Cullen.*)

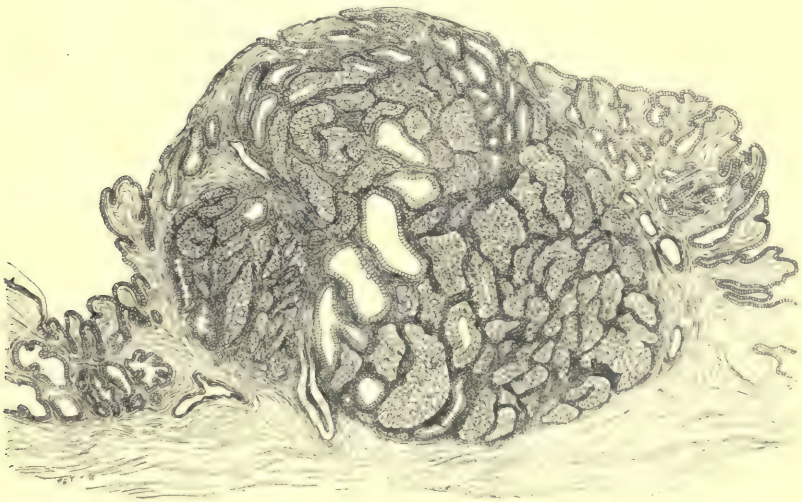


FIG. 80.—Adeno-carcinoma of cervix. Section of nodule growing in the cervical mucous membrane. (*Wyder.*)

been found in the body, and in which a direct connection through the lymph channels has been traced to pre-existing cancer of the cervix. In Fig. 81 we show such a case which we met in our own practice. These cases are however quite exceptional.

Symptoms.—The symptoms resemble those of cancer of the body. In the early stages, they may be very slightly marked, the unfortunate result of which is, that, frequently a patient

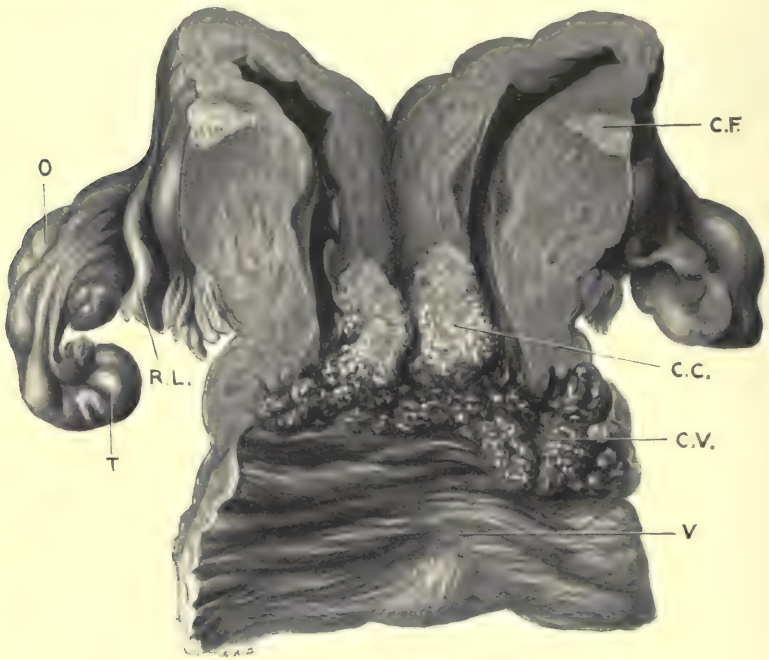


FIG. 81.—Epithelioma of cervix with secondary deposit in the fundus. C.C. Cervical cancer. C.V. Extension to vagina. V. Vagina. C.F. Extension to fundus. (From a specimen removed by the author.)

does not obtain medical advice until it is too late for anything to be done. The later symptoms are the result of the invasion of the neighbouring organs by the growth. Uræmia may occur from obstruction of the ureters, intestinal obstruction or a recto-vaginal fistula from involvement of the rectum, or a vesico-vaginal fistula from involvement of the bladder. Finally, metastatic growths may occur throughout the body.

Prognosis.—The prognosis in cancer of the cervix, even after early operation, is rather worse than the prognosis in cancer of

the body, inasmuch as the liability to its return seems to be greater. In cases in which operation is not performed, or in which the growth returns after operation, the causes of death are the same as in cancer of the body.

Treatment.—The same rules apply to cervical as to corporeal cancer; whenever possible the whole uterus must be removed, and with it as much of the para-cervical and para-uterine connective tissue as possible. Hysterectomy performed through the vagina is the operation which has been usually adopted in the past (*v.* page 447), but the more radical abdominal operation is undoubtedly more correct. The usual abdominal operation is that devised by Wertheim, or by Kelly and his pupils, but, in cases in which there is marked vaginal involvement, the operation devised by Werder of Pittsburg, in which the uterus is removed by a combined abdominal and vaginal operation, enables a very complete separation and removal of the vagina to be carried out. Supra- or infra-vaginal amputation of the cervix, which was at one time considered to be sufficient, has been entirely abandoned.

If the case is too far advanced for any radical treatment, much temporary benefit can be obtained by carrying out Marion Sims' treatment of curetting and cauterisation (*v.* page 407).

Sarcoma of the Uterus.

Sarcoma usually occurs during the child-bearing period. In this respect it differs from cancer, which usually starts about the menopause. It is also very much rarer than cancer, and, of the different forms, cervical sarcoma is the rarest.

Varieties.—Three forms of uterine sarcoma are met with :—

(1) Cervical sarcoma, or cystic myxo-sarcoma of the cervix.
(2) Spindle-celled sarcoma of the muscular coat of the uterus, or fibro-sarcoma.
(3) Round-celled sarcoma of the endometrium.

Pathological Anatomy.—Cervical sarcoma starts as a collection of polypi, resembling mucous polypi, hanging from the cervix. These polypi are soft, semi-cystic, and grow rapidly, until finally the mass resembles a bunch of grapes (*v.* Fig. 82). Cervical sarcoma may also occur as a more diffuse form, clinically resembling squamous-celled carcinoma. Spindle-celled fibro-sarcoma starts in the thickness of the muscular coat of the uterus, and

grows in a circumscribed manner. It is doubtful whether this form starts as a sarcoma, or whether it is the result of

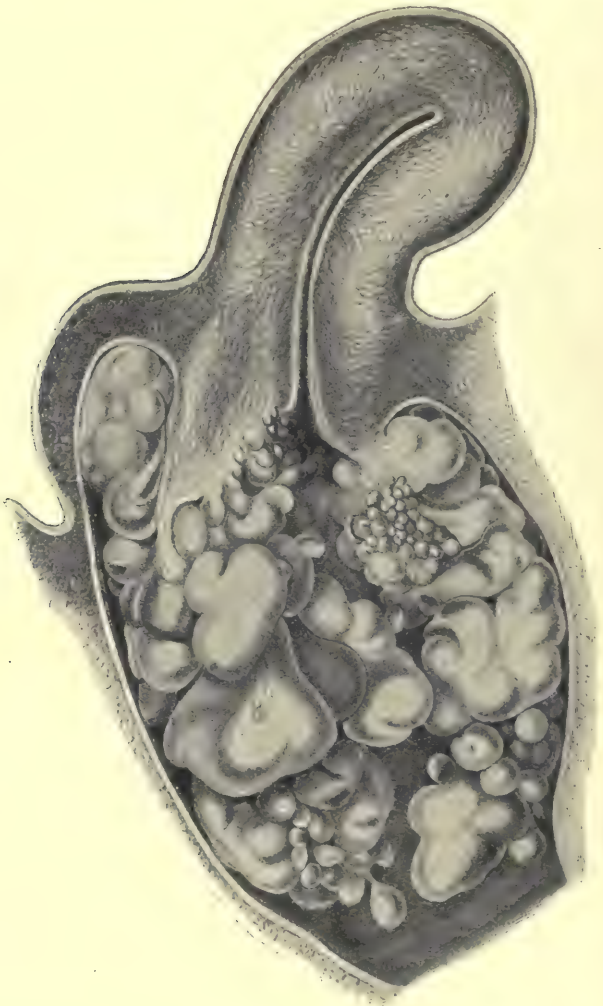


FIG. 82.—Cystic myxo-sarcoma, or grape-like sarcoma, of the cervix. (*Küstner.*)

sarcomatous degeneration taking place in a pre-existing myoma. Round-celled sarcoma of the endometrium occurs in two varieties :—as a localised sessile or pedunculated growth varying in size from that of a pea to rather less than that of a hen's egg

(*r*. Fig. 83); and as a diffuse malignant degeneration which affects part of or the entire endometrium.

Symptoms.—The symptoms of the cervical form are at first very slightly marked, but, as the sarcoma grows, similar symptoms result as in cancer of the cervix. The circumscribed

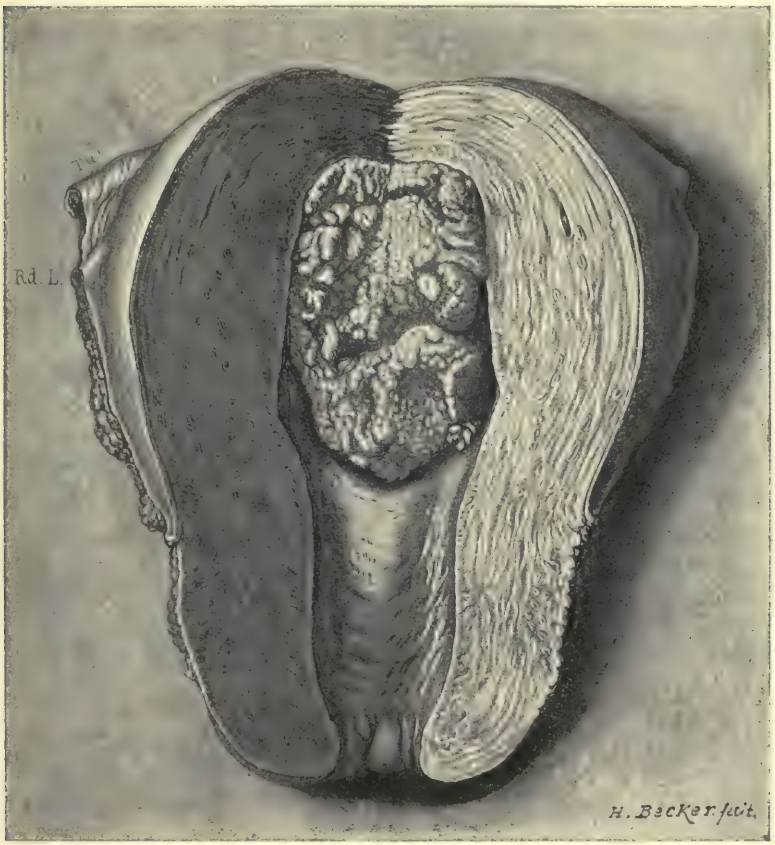


FIG. 83.—A circumscribed round-cell sarcoma of the body of the uterus. (Natural size.) (*Cullen.*)

fibro-sarcoma causes at first symptoms like those of a myoma, save that it grows more rapidly. At a later stage, it gives rise to the usual symptoms of malignant disease. A pedunculated sarcoma of the endometrium gives rise at first to no particular symptoms. Diffuse sarcoma of the endometrium causes similar symptoms to cancer of the body, with perhaps the exception that

the pain is less. A tolerably common accompaniment of this form of sarcoma is hæmatometra, *i.e.*, an accumulation of blood in the uterus, the result of the cervix becoming occluded by the growth of the tumour.

Diagnosis.—The diagnosis of cervical sarcoma can usually be made from the characteristic appearance of the growth hanging from the cervix. In sarcoma of the body, the uterus is more or less uniformly enlarged according as the disease is far advanced or not. If the disease has spread beyond the uterus, infiltrating

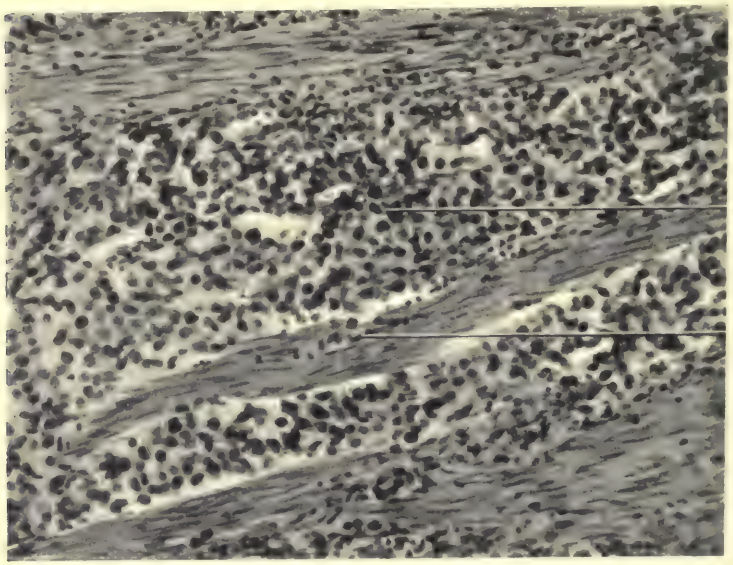


FIG. 84.—Sarcoma of uterus. *a*. Muscle of uterus. *b*. Sarcoma cells infiltrating muscle. (*Wigham.*)

masses can be felt in the pelvic connective tissue. When the growth has reached this stage, its further course resembles that of cancer. In the early stages, the diagnosis can seldom be made without a microscopical examination. Fibro-sarcoma, and pedunculated sarcoma of the endometrium, are very likely to be mistaken for myomata.

Prognosis.—The prognosis is more favourable than that of cancer if the case is operated on at a comparatively early stage, as sarcoma generalises itself less rapidly. In cases which are not operated upon, the prognosis is the same as that of cancer, and death usually comes about in a similar manner.

Treatment.—The treatment is the same as that of cancer. Total hysterectomy is always indicated if the case is seen in time; if not, and if the discharges are profuse, curetting and cauterisation may be performed with a view to checking the discharge.

Endothelioma of the Uterus.

Endothelioma of the uterus, though not recognised until within the last few years, is probably not as rare as is generally supposed. It may occur anywhere in the uterine wall, but in most of the recorded cases the cervix was the part affected. Both macroscopically and microscopically endothelioma closely resembles carcinoma, but the cells of which it is composed are endothelium, and not epithelium. In most cases the tumour originates in the endothelium lining the lymph canals, but in some cases, known as *peritoneal cancer*, it starts in the peritoneum. Endothelioma of the cervix, starting from the lymph-canals, bears a close resemblance to the ordinary epithelioma. The mucous membrane is, however, intact, and the nodules of the tumour are buried in the cervical wall. Later on, as the tumour enlarges, ulceration occurs. Under the microscope the tissue appears to be made up of patches of large flat cells, each patch being in direct relation to a lymphatic space. The cells are not as large as those found in squamous cancer, and there is not the same tendency for atypical forms to occur. The glands are unaffected.

In cases where the tumour starts in the endothelium of the peritoneum, the cells are similar to the normal cells of the peritoneum. A direct continuity may be traced between the peritoneum and the infiltrating masses of cells. The uterus undergoes a uniform enlargement. There is a great tendency to dissemination throughout the peritoneal cavity.

Diagnosis.—The diagnosis can only be made by microscopic examination, after removal of the tumour.

Treatment.—The treatment is similar to that of cancer of the uterus.

Chorion-Epithelioma.

Chorion-epithelioma is the term applied to a malignant growth which starts in the uterus, presumably from the fœtal membranes; invades the uterine wall; causes metastases in other organs; and quickly brings about the death of the patient.

Ætiology.—The ætiology of chorion-epithelioma was for a long time most obscure, and many different theories were brought forward to account for it. Of these theories four are worthy of mention :—

(1) That the tumour arises from the decidual cells. This was the first theory, and led Sänger to give the tumour the name *deciduoma malignum*, a name which he later changed to *sarcoma deciduo-cellulare*. He has, however, abandoned this theory.

(2) That the tumour arises from the stroma of the villi. It would thus be a sarcoma, and Gottschalk, who originated the theory, applied the name *chorio-sarcoma* to it. This view has received but small support, and has been abandoned by its founder.

(3) That the tumour is the result of the influence of pregnancy on a pre-existing sarcoma. This view was introduced by Veit, and for some time was supported by English writers. It has, however, been completely abandoned.

(4) That the tumour arises from the epithelial coverings of the chorionic villi. Under this heading are included several radically different views arising out of ignorance of the origin of these epithelial layers, and more particularly of the outer layer or syncytium. Now that the discovery of the Peters' ovum has in great part cleared up their origin, all but one of these views disappear. Still, as they are of historical interest they may be shortly described :—

(*a*) That the growth is derived from the syncytium alone, and that the latter is a maternal structure formed from the uterine endometrium. This theory was first adopted by Whitridge Williams, and was really a modification of that originally put forward by Sänger, and indeed Williams was at the time disposed to accept Sänger's theory as accounting for the histogenesis of certain cases. He, however, now also accepts Marchand's view.

(*b*) That the growth is derived from the syncytium alone, and that the latter is a fœtal structure formed from the ectodermic layer. This theory was adopted by several writers, and notably by Fränkel and Durante, and on this account the term "syncytial" or "ectodermic epithelioma," was applied to the growth. Fränkel has, however, also come to regard Marchand's view as correct.

(*c*) That the growth is derived from both the syncytium and Langhans' layer, and that the syncytium is a maternal structure.

This theory was held by Gebhard, who, in consequence, considered the growth to be a mixed carcinoma of maternal and fœtal structure. It does not appear to have had many other supporters, as the majority of those who consider the growth to be derived from both epithelial layers also adopted, and correctly, as we now know, the fœtal origin of these layers.

(*d*) That the growth is derived from both epithelial layers and that both are of fœtal origin. This view was introduced by Marchand. At first it was strongly opposed by the London school, but is now almost universally accepted.

Marchand's view is founded on the anatomical and physiological resemblances between the chorionic epithelium and the tumour tissues, and has been fully supported by a re-investigation of the pathology of vesicular mole, by which it was shown that hypertrophy of the chorionic epithelium is a constant feature. Finally, the finding of the Peters' ovum definitely demonstrated the fœtal origin of the two layers of the chorionic epithelium.

The growing trophoblast, as was long suspected, possesses the power of invading and destroying the maternal tissues up to a certain point, where apparently the resistance of the maternal tissues becomes sufficient to check this action and an equilibrium is established. In the case of the simple vesicular mole, the epithelial layers proliferate, but their power of maternal invasion is not increased. In the malignant vesicular mole, all the elements of the villi proliferate and invade the uterine wall, the epithelial layer, however, being apparently the active agent of destruction. In the pure chorion-epithelioma, the epithelial layers alone proliferate and invade the uterine wall, and no trace of the mesoblastic core of the villus is found. Intermediate between true chorion-epithelioma and the malignant form of vesicular mole, tumours are found consisting of syncytium and cells of Langhans' layer, through which are scattered a few villi with or without proliferation of their mesoblastic core. These intermediate forms emphasise the close connection between the malignant vesicular mole and the chorion-epithelioma, if indeed they do not make it impossible to draw a definite distinction between them, and they also render still more clear the epiblastic origin of the chorion-epithelioma.

Pathological Anatomy. — The growth at first appears as a pedunculated or sessile tumour, varying in size between that of a

pea and that of an orange. It is attached to the uterine wall and bulges somewhat into the uterine cavity. In consistency, it is friable and easily broken down by the curette; it is greyish in colour and marked here and there over its surface by hæmorrhagic areas. As it grows, it extends into the uterine muscle, and spreads along it in isolated nodules over which the mucous membrane is at first unaltered. Finally, however, the mucous membrane lining a great part of the cavity becomes involved and destroyed. The entire cavity then becomes filled by a fungating

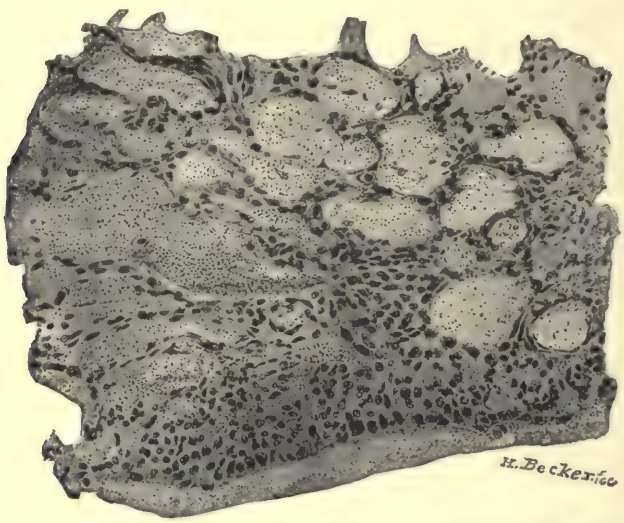


FIG. 85.—Chorion-epithelioma, showing alveolar arrangement of primary tumour. × 60. (*Williams.*)

mass of placenta-like substance, which breaks down readily under the finger or curette, and bleeds freely. Metastatic growths are the result of emboli carried along in the blood-stream, or of the direct implantation of fragments of the growth on wound-surfaces. They are found most commonly in the lungs and vagina, and also in the broad ligaments, and in the liver, heart, and other viscera.

The histological character of the growth demands some consideration. In many of the recorded cases, differences of structure have been found; still, there are certain characteristics which can be found in almost every case. Speaking generally, the growth is found to be composed of blood-clot, two varieties of cellular

elements, and chorionic villi. Haultain describes the cellular elements as follows:—The cellular elements are of two types:—

(1) Large polyhedral cells, which stain lightly, and whose large nuclei show a wide intra-nuclear network.

(2) Multinucleated deeply-staining protoplasmic masses of all varieties of shape, whose nuclei are extremely rich in chromatin and show no wide intra-nuclear network as in the other cells.

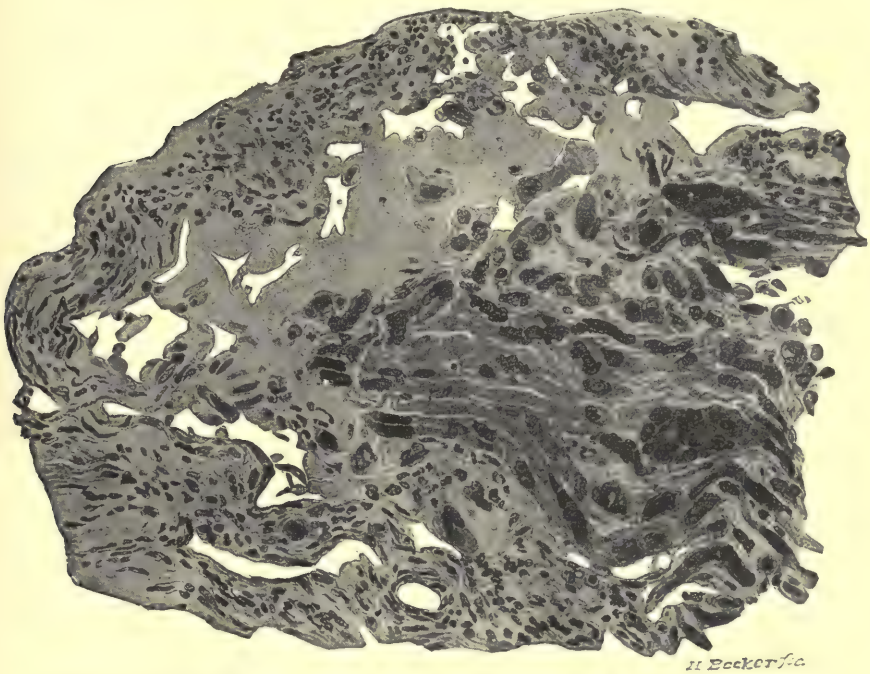


FIG. 86.—Chorion-epithelioma, showing syncytial masses invading a venous channel. (*Williams.*)

Both varieties of elements show a marked tendency to retraction of their protoplasm and to vacuolation. Mitotic figures are frequently observed in the individual cells, but nowhere in the protoplasmic masses. The relation of these two types of cells varies greatly; in some cases it appears as if groups of individual cells were confined in alveoli formed by processes of nucleated protoplasm. This is most apparent in groups in close relation to the chorionic villi. As one proceeds further from the villi, the cells and protoplasmic masses are arranged indefinitely. In some

places, the individual cells are much in excess of the protoplasmic masses, while in others the latter only are to be distinguished. Nowhere is there much evidence of inter-cellular substance or blood-vessels, although free blood is intimately mixed with the cells, and is also found in the vacuoles in their substance. Extending into the muscle can be seen clumps of both types of cells, apparently following the peri-vascular lymph-spaces, while, throughout, individual cells may be seen finding their way irregularly, with a special tendency to penetrate the venous sinuses and engraft themselves on the interior of their walls, where they continue to proliferate.

On section of the tumour, three areas may be determined microscopically :—

(1) A sub-mucous or peripheral area, which forms the main bulk of the tumour mass, and is necrotic in character, composed of fibrin and cellular elements in all stages of degeneration.

(2) A cellular area, constituting the tumour proper, which is composed entirely of actively proliferating cellular elements and chorionic villi mixed with free uncoagulated blood.

(3) An area of infiltration in which may be seen cells and protoplasmic masses, isolated and in groups, insinuating themselves into the blood channels and surrounded by the muscle fibres of the uterine wall. In this area, chorionic villi are not found.

Symptoms.—The earliest symptom of chorion-epithelioma consists in a recurrence of irregular hæmorrhages within a few weeks after an abortion or the expulsion of a vesicular mole. In a few cases, the hæmorrhage does not commence until some months after the abortion, but this is quite exceptional, and, in such cases, it is possible that in the interval the patient has had another abortion. The hæmorrhage is, as a rule, considerable in amount. In the intervals between the attacks, there is a more or less fœtid, watery, and blood-stained discharge. Each day the patient's general condition becomes worse, as a result of the previous hæmorrhages, and cachexia is caused by absorption of ptomaines from the necrosing growth, and at a later stage by the occurrence of metastases. Her temperature rises as soon as intra-uterine decomposition occurs, and assumes a hectic type. Usually, the first symptom of metastases is the occurrence of a persistent cough due to extension to the lungs, auscultation of which will reveal the existence of patches of consolidation.

On vaginal examination, the cervix is found to be sometimes closed and sometimes patulous. If the finger is passed into the uterine cavity, a fungating growth is felt which more or less fills the cavity according to the stage it has reached, and which breaks down readily under the finger. The body of the uterus enlarges rapidly in proportion to the growth of the tumour, and may rise above the level of the pelvic brim.

Diagnosis.—The diagnosis of chorion-epithelioma is not difficult, once our attention is directed to the possibility of its presence. We cannot draw attention too strongly to the necessity for careful bimanual examination in all cases in which hæmorrhage recurs after pregnancy. If the uterus is not enlarged, it will be sufficient to curette it and examine the scrapings microscopically, but, if it is enlarged, the finger should be passed into it and the cavity explored. A chorion-epithelioma may, in an early stage, be confounded with a small sub-mucous myoma; a distinction can be made by noting the ease with which, in the former case, the growth is broken down with the finger-nail or curette. In a later stage, it may be mistaken for portions of retained and decomposing, placental tissue. As the retention of such fragments is always possible after abortion or labour, this is a very natural and probable mistake to make. It can, however, be avoided, first, by noting that it is impossible to remove all the fungating mass which fills the uterine cavity in the case of a chorion-epithelioma, while this can as a rule be easily done in the case of retained portions of placenta; and, secondly, by submitting the removed fragments to a competent microscopist for examination. In selecting portions for microscopical examination, the superficial parts of the growth must be avoided, as these usually consist of little but necrosed tissue and blood-clot. The characteristic appearances will only be found when the removed portion comes from the neighbourhood of the spreading edge of the growth.

Treatment.—There is only one treatment applicable to chorion-epithelioma. It is a malignant growth, and must be treated accordingly. Complete extirpation of the uterus alone affords any hope of cure, and must be performed in every case, as soon as the condition is recognised. The presence of metastases is not a contra-indication to operation, as it is believed that sometimes they are absorbed or otherwise destroyed by the surrounding

tissues, consequently, hysterectomy should be performed whenever the condition of the patient offers a hope that she will be able to stand the attendant shock.

Prognosis.—The prognosis in chorion-epithelioma, which is not operated upon, is, so far as we at present know, absolutely bad, death occurring within a period varying from some weeks to six months, according to the rapidity with which the tumour grows. Death may be directly due to hæmorrhage, to septic absorption, or to metastatic pneumonia. If the uterus has been completely removed, and there are not any metastases present, the prognosis is good.

TUBERCULOSIS OF THE UTERUS.

Tuberculosis of the uterus, as a primary condition, is a comparatively rare disease; it is more common as the result of extension from a tuberculous tube or ovary, or as part of a general tuberculosis.

Varieties.—It occurs in three forms (Pozzi) :—

(1) An acute miliary form. This occurs as part of a general tuberculosis.

(2) An interstitial form. This may occur in the uterine wall, and cause no symptoms until it manifests itself by some sudden and serious accident, such as rupture of the weakened uterus during delivery.

(3) An ulcerative form. This is the commonest form; in it the disease starts as small nodules in the endometrium or in the vaginal portion of the cervix. These nodules gradually coalesce and break down, until finally the entire endometrium and endocervix are replaced by tubercular tissue which in places is becoming caseous.

Diagnosis.—The symptoms of the patient in the early stage are those of endometritis. Later on, as the disease spreads, and the uterus becomes infected by other micro-organisms, the patient becomes hectic, and exhibits the general symptoms of a mixed tuberculous infection. If the uterus is curetted at an early stage, there may be no naked-eye change in the endometrium. But, if the removed fragment is examined microscopically, typical tuberculous structure will be found. In later stages of the disease, when caseous changes are taking place,

the existence of tuberculous lesions may be suggested by the appearance of the removed portions. Tubercle bacilli may be found in the sections and in the uterine discharges, but as a rule they are very few and difficult to find.

Treatment.—If it could be positively determined that the tuberculosis was entirely limited to the endometrium, it might be sufficient thoroughly to curette and cauterise the latter. It is, however, practically impossible to determine this, and consequently it is necessary, in all cases where a diagnosis of tuberculosis is made, to remove the uterus. On the other hand, the introduction of steam into the uterus (Pincus) (*v.* page 397), or of boiling water (Schick), may be found to be of use.

CHAPTER X.

DISEASES OF THE FALLOPIAN TUBES.

Inflammatory Diseases of the Tubes. Salpingo-oöphoritis—Ætiology—Pathological Anatomy: Salpingitis—Acute Salpingitis—Chronic Salpingitis: Varieties—Cystic Changes in the Tube: Oöphoritis—Acute Oöphoritis—Chronic Oöphoritis—Symptoms—Diagnosis—Prognosis—Treatment, Palliative, Radical. New Growths of the Tubes: Benign Neoplasms—Malignant Neoplasms. Tuberculosis of the Tubes—Pathological Anatomy—Treatment. Tubal Pregnancy. Absence of the Appendages.

The following are the principal pathological conditions met with in the Fallopian tubes:—

Inflammatory diseases.
New growths.
Tuberculosis.
Tubal pregnancy.

INFLAMMATORY DISEASES OF THE TUBES.

Inflammatory diseases of the tube may exist alone, or may co-exist with a similar condition of the ovaries. The symptoms, and the physical signs to which each condition gives rise, are practically identical, whether each exists separately or whether they are found to co-exist. Accordingly, it will be best to describe the two under the heading *salpingo-oöphoritis*, but the distinctive lesions of each structure must be described separately. Tuberculosis of the ovary and tube will be discussed under this head also, as it is impossible in the great majority of cases to distinguish, without the aid of the microscope, tubercular lesions from those produced by pyogenic bacteria.

Salpingo-oöphoritis.

Salpingo-oöphoritis (σάλπιγξ, a trumpet; ὠόν, an egg; φορέω, I bear), in some of its forms, is the most frequent and important result of bacterial infection of the pelvic contents.

The condition has been recognised for a long time, but only during the last twenty or thirty years has its importance been understood, and its pathology and treatment been elaborated. Lawson Tait in 1872 was the first person successfully to remove inflamed appendages; and since that time, our knowledge of disease of the appendages has continued to advance rapidly.

Ætiology.—Salpingo-oöphoritis is always bacterial in origin, though in most cases, at the time of operation, the presence of bacteria cannot be detected. In such cases the invading bacteria have produced their effect, and have then disappeared, killed by the toxins they produce. In a series of 648 cases collected by Andrews, from various British, Continental and American writers, in 55 per cent. the tubes were sterile, in 22·5 per cent. the Gonococcus was found, in 12 per cent. the Staphylococcus or Streptococcus, in 6 per cent. various saprophytic organisms, in 2·5 per cent. the Bacillus Coli Communis, and in 2 per cent. the Pneumococcus. It is probable that some of the cases recorded as "sterile" were tuberculous in origin.

The origin of the infection in the greater number of cases is a previous metritis, which in turn has been caused by the extension of infection upwards from the vagina. In this manner, gonorrhœal and puerperal infections of the tubes occur. In other cases, infection occurs directly from the intestine, or through lymphatics which run in the ligament connecting the right ovary with the vermiform appendix (Vallin). In such cases, ovarian infection will frequently precede the tubal infection, while in the case of extension of infection from the uterus the reverse is the case. Tuberculous infection may occasionally occur as an extension of a primary infection of the uterus or pelvic peritoneum, but primary infection of the tube is the more common occurrence. In the latter case, the infection is probably carried by the blood-stream.

In addition to these modes of infection, salpingo-oöphoritis has followed infective diseases, as—typhoid, measles, scarlatina, cholera, smallpox, and influenza. In such cases, it is probably closely connected with the acute metritis which also has been found in association with these diseases. Syphilis and actinomycosis must also be added as very rare causes.

Pathological Anatomy.—In the greater number of cases, salpingo-oöphoritis is a bilateral condition. This is due to the proximity

in which the appendages lie to one another; and also to the fact that, when the uterus is the source of the infection, it is unlikely such infection will extend into one tube and spare the other. Similarly, if the tube becomes infected, extension to the ovary sometimes occurs, also owing to their close approximation (*v.* Fig. 88).

It is surprising, how frequently healthy, or comparatively healthy, ovaries may be associated with marked tubal infection. In a series of thirty-two cases operated on by the author, in only three cases were both ovaries so diseased as to require removal, in eleven cases one ovary had to be removed, and in eighteen cases neither ovary had to be removed. This is an important point to remember, as it makes a great difference to the subsequent

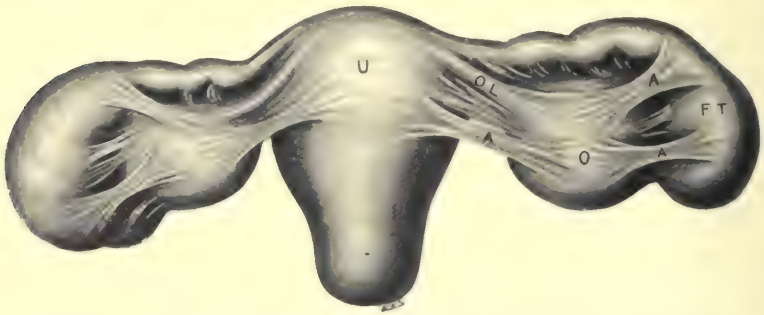


FIG. 87.—A typical case of salpingo-oöphoritis. ("Report of the Rotunda Hospital," 1896–7.)

comfort of the patient if even a portion of an ovary can be left. We shall refer to this subject again (*v.* page 490).

In order to discuss the various forms under which tubal and ovarian inflammations are met, it will be necessary to consider the pathological anatomy of salpingitis and oöphoritis separately.

SALPINGITIS.—Two varieties of salpingitis (*σάλπιγξ*, a trumpet) are met with:—

(A) Acute salpingitis.

(B) Chronic salpingitis.

(A) **Acute Salpingitis.**—Both acute and chronic salpingitis can be divided into endosalpingitis and interstitial salpingitis, according as the infection attacks the mucous membrane or the muscular coat. In acute salpingitis, however, the two forms so

commonly occur in conjunction that it does not seem to be necessary to make such a distinction.

For instance, in a typical case of gonorrhœal salpingitis, an acute infection spreading upwards from the uterus may, in one patient, cause primarily an endosalpingitis, in another patient an interstitial inflammation. Whichever of these started first will, as a rule, be quickly followed by the other, and the two conditions will co-exist. The pus which forms in the tubes gradually

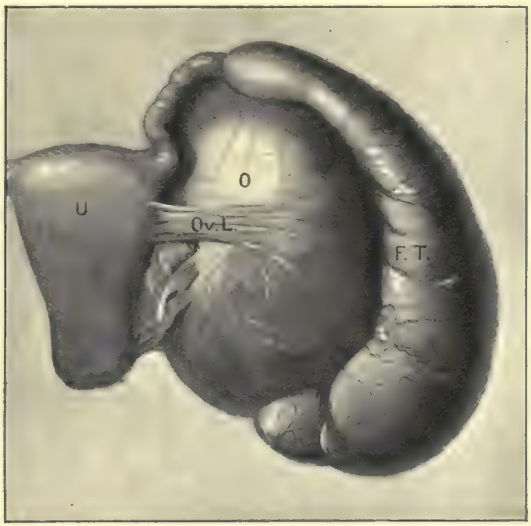


FIG. 88.—A tubo-ovarian cyst, the result of salpingo-oöphoritis. U. Uterus. O. Ovary. F.T. Fallopian tube. OV.L. Ovarian ligament. (From a specimen in the Pathological Laboratory, Trinity College, Dublin.)

escapes into the uterus or the peritoneal cavity, if the turgescence of the mucous membrane near the ends of the tubes does not completely block the ostia. If, on the other hand, the outflow of pus is obstructed, owing to the blocking of both ostia of the tube, the pus accumulates, and finally the tube is converted into a pus-containing sac, and the condition known as pyosalpinx (*πῦον*, pus ; *σάλπιγξ*) results.

As the pus continues to accumulate, the walls of the tube become by degrees thinner, until finally all trace of their previous structure disappears (*v.* Fig. 89).

The macroscopical appearance of a tube in the early stages of

acute endosalpingitis is not very striking. The tube is slightly enlarged, congested, and œdematous; and on cutting it open, the mucous membrane is seen to be thickened and inflamed. There is a small amount of muco-purulent or purulent fluid in the cavity. The fimbriæ are swollen and covered with flakes of lymph, and there may be some friable adhesions in process of formation between the tube and intestines. If there is an interstitial inflammation present as well, as is usually the case, the tube may be enlarged up to the size of a finger, and minute points of pus may be seen scattered about in the thickness of the walls. The tubal enlargement is due to marked thickening of

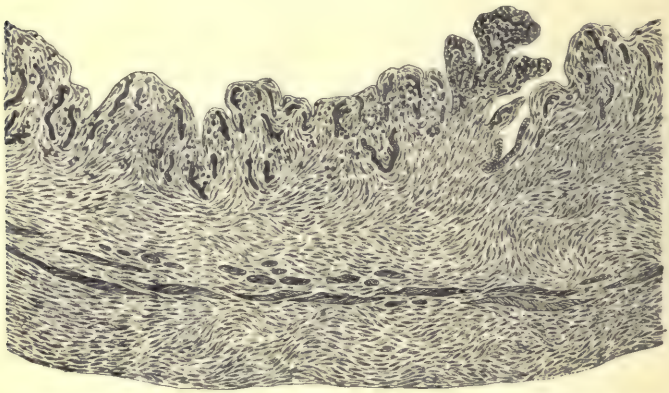


FIG. 89.—Diagrammatic section through the wall of the tube in a case of pyosalpinx. (*Wyder.*)

the muscle wall of the tube and to hyperplasia of its connective tissue, and not to dilatation of the cavity. As a rule, the abdominal ostium becomes partially or completely closed, and the mechanism by which this occurs is worthy of note. In some cases, the fimbriæ, spread out fanwise, become adherent to some neighbouring structure, as the ovary, the back of the broad ligament, or the floor of Douglas' pouch. In other cases, a more interesting mechanism occurs (Bland-Sutton).—When the tubes are inflamed, the muscular and serous coats lengthen, and bulge over the fimbriæ until each ostium appears as a rounded orifice with smooth instead of fringed margins; gradually these margins contract, cohere, and occlude the opening. In the early stage, if the rounded end of the occluded tube is slit up, the

fimbriæ will be found crowded inside the tube. The usual consequences of this closure are the accumulation of pus in the tube and the formation of a pyosalpinx. This condition will be discussed later under the head of cystic changes in the tube (*v.* page 197).

The microscopical appearance of the tube in acute salpingitis is as follows:—The sub-epithelial layer of the mucous membrane is infiltrated with small round cells and the vessels are dilated;

FIG. 90.—Acute salpingitis of septic origin. *a*. Fibro-muscular wall of tube. *b*. Dilated blood-vessel. *c*. Fold of mucous membrane showing dilated vessels. *d*. Purulent exudate. *e*. Lumen of tube. (*Wigham.*)

as a result, there is a marked increase in the size of the folds of the mucous membrane (*v.* Figs. 90 and 91). On the surface of the folds are seen small vegetations, which tend to become adherent one to the other and so to cause the formation of crypts in the walls. If the infection has extended beyond the mucous membrane, the walls of the tube are greatly thickened, owing to hypertrophy and hyperplasia of the muscle and the connective tissue, and to a round-celled infiltration and vascular dilatation. In the walls are seen minute points of pus, and colonies of the infecting bacterium may be found in the lymphatic interspaces.

The changes, which occur in the wall of the tube when the latter becomes cystic, will be discussed later (*v.* page 197).

(B) **Chronic Salpingitis.**—Chronic salpingitis occurs as the sequence of an attack of acute salpingitis, or in consequence of a less virulent infection than that which causes acute salpingitis. Two forms of chronic salpingitis are met with:—

(1) Chronic endosalpingitis, or catarrhal salpingitis, *i.e.*, inflammation of the tubal mucous membrane.

(2) Chronic interstitial salpingitis, *i.e.*, inflammation of the walls of the tube.

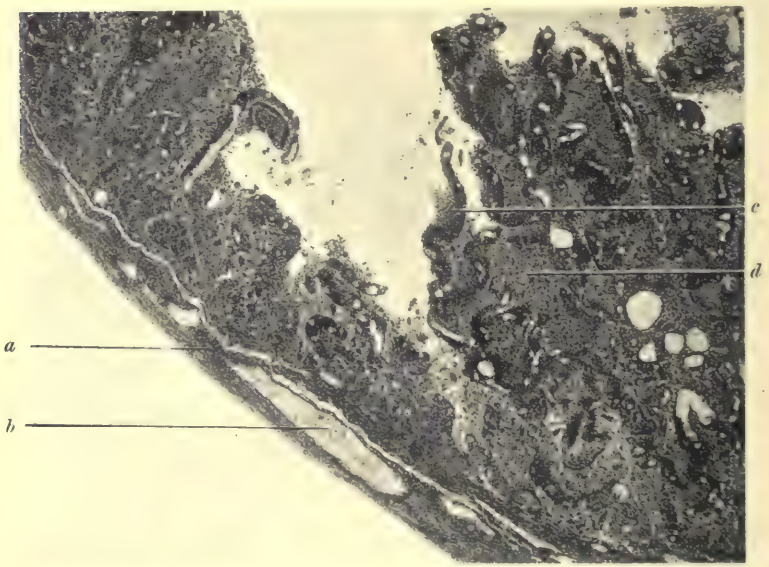


FIG. 91.—Acute salpingitis of septic origin. *a*. Fibro-muscular wall of tube. *b*. Dilated blood-vessel. *c*. Fold of mucous membrane showing dilated vessels. *d*. Purulent exudate. (*Wigham.*)

Chronic endosalpingitis, and interstitial salpingitis, usually co-exist in those cases which are the result of an attack of acute salpingitis, but as a rule one or other form predominates.

(1) *Chronic Endosalpingitis.*—Chronic endosalpingitis (ἔνδον, within; σάλπιγξ), or inflammation of the mucous membrane lining the tube, is, in those cases in which it exists alone, most frequently the result of a subacute infection. If such is the case, a serous catarrhal inflammation results, and, if the ostia of the

tube become blocked, the condition known as hydrosalpinx (ὕδωρ, water; σάλπιγξ) results. If the infection is pyogenic in character, and the outflow of pus is prevented, a pyosalpinx may result, as in the acute condition.

(2) *Chronic Interstitial Salpingitis.* — Chronic interstitial salpingitis causes extreme thickening of the walls of the tube, so that the latter may reach the size of a finger or even more without any dilatation of its lumen (*v.* Fig. 92).

In addition, the walls of the blood-vessels are thickened and are sometimes undergoing hyaline degeneration. The appearances found in tuberculous salpingitis will be discussed later (*v.* page 212).

There is an interesting condition known as nodular salpingitis, which is probably a final stage of chronic salpingitis, but which cannot be conveniently included under the head of either endosalpingitis or interstitial salpingitis. In this condition, nodules are to be found at intervals along the tube, separated from one another by portions of tube which may be of normal size or somewhat thickened. These nodules vary in size from a tenth of an inch to half an inch in diameter, and their effect is to give the tube somewhat the appearance of a rosary. They are caused in some cases by localised hypertrophy and hyperplasia of the tubal wall, and in other cases by the formation of small cysts lined with epithelium and apparently arising from the tubal mucous membrane. More rarely they may be caused by small collections of calcified detritus left by old and healed tuberculous lesions. The origin of the nodules is probably in all cases tubercular or gonorrhœal. In some cases they completely occlude the lumen of the tube, and in other cases they so compress it as practically to obliterate it.

Cystic changes in the tube.—When the closure of the abdominal ostium of the tube is associated with the continued formation or collection of fluid in the tube, cystic dilatation results. To this condition the term sacto-salpinx (σακτός, crammed; σάλπιγξ) has been applied. This term embraces three different conditions:—

(1) Pyosalpinx—a tube distended with pus.
(2) Hydrosalpinx—a tube distended with clear water-like fluid.
(3) Hæmatosalpinx—a tube distended with blood.

The first two of these are probably always the result of inflammatory changes in the tube, while the third may be the

FIG. 92.—Chronic interstitial salpingitis. Transverse section through entire tube. (× 10 diameters.) 1. Thickened tube wall. 2. Thickened and anastomosing tubal villosities. 3. Crypts formed by the anastomosing villosities. 4. Blood-vessel. 5. Accessory tubal lumen. (*Pozzi.*)

result of inflammatory changes, but usually is not. It is, however, convenient to discuss it here with the others.

The shape of a sacto-salpinx is very characteristic. The tube becomes retort-shaped, the larger end of the retort corresponding to the outer third of the tube, the narrower end to the uterine insertion. In a typical case the fimbria have disappeared from view, and the outer end of the sacto-salpinx is smooth and rounded. The walls have usually undergone pressure-atrophy in proportion to the amount of fluid formed, and, in very advanced cases, may be so distended as to be almost translucent. The remaining changes depend upon the contents of the tube.

(1) *Pyosalpinx.*—A pyosalpinx is the result of the accumulation of pus in a tube whose abdominal ostium is closed. The uterine ostium is usually patent, but the escape of fluid is prevented by the swollen condition of the mucous membrane. The peritoneum is thickened, and is usually adherent to the neighbouring peritoneum. The muscle wall is at first thickened, but, as increased quantities of pus form, it becomes thin and atrophic, and minute points of pus may be scattered through it. The mucous membrane is usually destroyed and replaced by granulation tissue, which finally changes into a smooth fibrous lining. The fluid contained in the tube consists of pus, mucus, and small quantities of blood. Calcareous deposits, cholesterin, degenerated epithelial cells, and granular *débris* may also be present.

(2) *Hydrosalpinx.*—The origin of a hydrosalpinx is by no means easy to explain. The usual and probably the correct explanation attributes it to the result of a sub-acute inflammatory salpingitis, which causes the outpouring of a serous fluid into the tube. Another explanation is that a hydrosalpinx is the remains of a pyosalpinx in which the pus cells have undergone fatty degeneration and disappeared, leaving the watery portion of the fluid behind. There are many difficulties in the way of accepting this explanation. As in a pyosalpinx, the abdominal ostium of the tube is closed, while the uterine ostium may be sufficiently patulous to allow drops of fluid to be forced through it by pressure upon the tube.

Kelly describes four varieties of hydrosalpinx—simple hydrosalpinx, follicular hydrosalpinx, *Hydrops tubæ profluens*, and tubo-ovarian cysts. In simple hydrosalpinx the tube is converted into a retort-shaped cyst. In follicular hydrosalpinx the tube is

similar in shape to a simple hydrosalpinx, but is usually smaller in size. On cross-section, however, instead of finding a single cavity, the lumen of the tube is diminished or displaced by a network of tissues formed in the inner wall, and bounding oval spaces varying in size from a pin point to eight millimetres in diameter (*v.* Fig. 93). These spaces are full of fluid, and apparently communicate with one another (Kelly). In *Hydrops tubæ profluens* the tube at one time may present the appearance seen in simple hydrosalpinx, but at another may be found to be collapsed and empty. Such cases are due to the recurrent

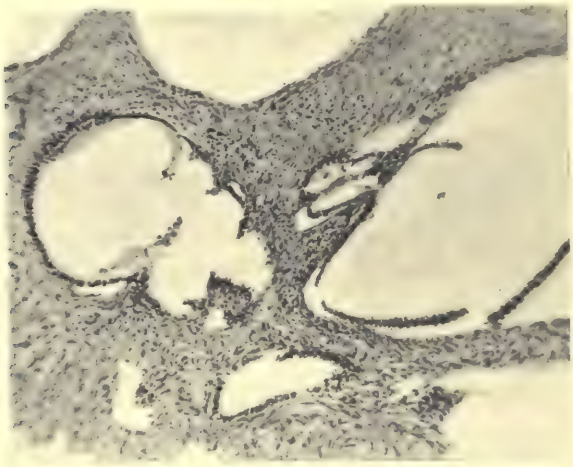


FIG. 93.—Follicular salpingitis. The epithelium has fallen away from the wall of some of the cystic spaces. (*Wigham.*)

accumulation of fluid in the tube, whence it is expelled periodically into the uterus. If such cases are examined prior to the escape of fluid, a distended tube can be felt, and after the fluid has escaped the tumour has disappeared.

A tubo-ovarian cyst is the condition in which a cyst of the ovary communicates with a cystic tube, so that there is free passage of fluid between the two (*v.* Fig. 88). The mode of origin of these cysts is obscure, and many different theories have been suggested to account for them. The simplest of these attributes them to the adhesion of a cystic tube to a cystic ovary, and the subsequent and gradual absorption of the wall intervening between the two cysts.

Similar changes occur in hydrosalpinx in the peritoneum covering the tube as in pyosalpinx, but, as a rule, the signs of an acute inflammation are absent, and the peritoneum is smooth and glistening. The muscle wall shows very little sign of inflammation and, as the amount of fluid increases, becomes gradually thinner. The mucous lining similarly undergoes pressure atrophy, save in the follicular form, in which it presents the changes already mentioned.

The fluid in a hydrosalpinx contains albumen, granular *débris*, and a few leucocytes and degenerated epithelium. It is of low specific gravity—1005–1010. Its reaction is neutral or alkaline, and in general appearances it resembles blood serum.

(3) *Hæmatosalpinx.*—A hæmatosalpinx (αἷμα, blood; σάλπιγξ) is not usually due to tubal infection, but still it is convenient to discuss it here. It may be caused in three ways:—

(*a*) By the rupture of the wall, or of vessels in the wall, of the sac of a tubal pregnancy. This is very much the commonest cause of a hæmatosalpinx, and is even said by some writers to be the only cause. There do not, however, appear to be sufficient grounds for making so definite a statement, and it is probable that many cases of hæmatosalpinx are due to other causes. A hæmatosalpinx which is due to tubal pregnancy may be distinguished by the following signs (Labadie-Lagrave):—

(*α*) The presence, in the blood or clot which fills the tube, of a particularly large and firm clot. It may be that the embryo will be found inside this, but most frequently it has been absorbed.

(*β*) Marked hypertrophy of the cyst wall.

(*γ*) The presence of chorionic villi or of decidual cells on the surface of the mucous membrane of the tube.

(*b*) By the retention of menstrual blood as a result of a congenital or acquired atresia of some part of the genital passages (*v.* page 261).

(*c*) By the rupture of vessels in the wall of the tube in a case of catarrhal or interstitial salpingitis.

Various changes sometimes take place in the contents of a cystic tube. Thus, a hydrosalpinx may be converted into a pyosalpinx; or, on the other hand, it is said that a pyosalpinx, by the gradual absorption of its cellular contents, may be converted into a

hydrosalpinx. Similarly, hæmorrhage may occur into the sac of a pyosalpinx or tubo-ovarian abscess; or the contents of a hæmatosalpinx may become infected and suppurate, thus leading to the formation of a pyosalpinx.

The contents of a cystic tube or tubo-ovarian abscess may escape. This can occur in two ways:—either by the fluid making its way downwards into the uterus through the uterine end of the tube; or by rupture of the sac. In the former case, the escape of fluid may occur at intervals, according as the intra-tubal pressure becomes sufficiently great to overcome the resistance offered to its outflow by the swollen mucous membrane. This condition was formerly known as *Hydrops tubæ profluens*, and

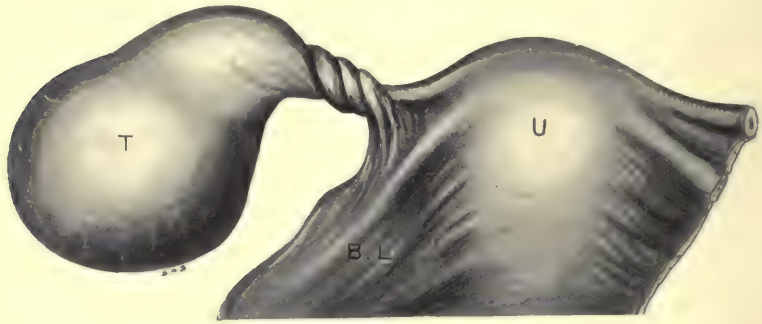


FIG. 94.—A pyosalpinx which has become twisted. U. Uterus. T. Tube. B.L. Broad ligament. ("Rotunda Hospital Report," 1896–7.)

has been already described. Moreover, a tube may burst owing to over-distension or violence, especially during a bimanual examination or any surgical interference. A ruptured tube may discharge its contents into the general peritoneal cavity, into a loculus in the pelvis between adhesions, into the layers of the broad ligament, or into any of the neighbouring hollow viscera, most frequently perhaps the rectum.

A third change consists in the torsion of the tube, as not infrequently occurs in the case of ovarian cysts. In the case of the dilated tube, however, torsion is a much rarer condition, owing to the manner in which the broad ligament becomes thickened by inflammatory infiltration. Fig. 94 shows an interesting specimen of this condition removed by Purefoy at the Rotunda Hospital.

Oöphoritis.—Two varieties of oöphoritis (ὠόν, an egg; φορέω, I bear) are met with—

(A) Acute oöphoritis.

(B) Chronic oöphoritis.

(A) **Acute Oöphoritis.**—Acute oöphoritis occurs in three forms :—

(1) Acute cortical oöphoritis.

(2) Acute parenchymatous oöphoritis.

(3) Acute interstitial oöphoritis.

(1) *Acute Cortical Oöphoritis.*—Acute cortical oöphoritis is the term applied to inflammation of the superficial tissue of the ovary, a condition which is usually found associated with acute peri-oöphoritis or peritonitis. The peri-oöphoritis has given rise to the formation of a pseudo-membranous covering, underneath which the cortical layer of the ovary is hyperæmic and slightly enlarged. If the inflammation extends inwards, the entire oöphoron, or egg-bearing portion of the ovum, may be destroyed. It is usually the result of gonorrhœa (Labadie-Lagrave).

(2) *Acute Parenchymatous Oöphoritis.*—Acute parenchymatous oöphoritis is the term applied to inflammation of the follicles of the ovary. At first cloudy swelling of the epithelial cells occurs, and subsequently disintegration. Later on, the follicles become filled with pus. Parenchymatous oöphoritis most frequently occurs after infectious diseases (Petit).

(3) *Acute Interstitial Oöphoritis.*—Acute interstitial oöphoritis is the term applied to inflammation of the interstitial tissue of the ovary. It is usually a gonorrhœal, or a puerperal septic, process. The ovary increases in size owing to an infiltration of small round cells, and numerous small abscesses and cysts are scattered through its substance, starting either in the follicles or in the stroma. In some cases there may be a peculiar œdematous condition of the ovarian stroma, resembling a similar condition found in chronic oöphoritis (Pilliet). This condition is also known as acute œdematous oöphoritis.

(B) **Chronic Oöphoritis.**—Chronic oöphoritis occurs as the sequence of an acute infection, or is a chronic process from the commencement. It is found in several forms, but though these can with advantage be described separately, it must not be

forgotten that they are merely stages in the course of the same condition. These forms are as follows:—

(1) Chronic cortical oöphoritis.
(2) Chronic interstitial oöphoritis.
(3) Chronic hypertrophic oöphoritis.
(4) Chronic atrophic oöphoritis (cirrhosis).

(1) *Chronic Cortical Oöphoritis.*—Chronic cortical oöphoritis consists in the formation of new connective tissue in, and consequent thickening of, the cortical layer of the ovary. It is usually the result of an acute cortical oöphoritis, but sometimes occurs without any apparent connection with an antecedent infection. In addition to this formation of connective tissue, there is also in many cases a cystic condition of the follicles, and not infrequently hæmorrhages may occur either into them or into the corpora lutea.

(2) *Chronic Interstitial Oöphoritis.*—Chronic interstitial oöphoritis is a later stage of cortical oöphoritis, in which a new growth of connective tissue extends all through the ovary. It is probably always a chronic process from the start (Labadie-Lagrave). As a result, an œdematous infiltration of the stroma may occur, or interstitial hæmorrhages from the rupture of dilated vessels. Interstitial oöphoritis not infrequently occurs in association with, and perhaps as the result of, myomata of the uterus and of very chronic backward displacements. Sometimes, a single central abscess may form, and either remain as a chronic condition or increase in size until the entire ovary is destroyed.

(3) *Chronic Hypertrophic Oöphoritis.*—Hypertrophic oöphoritis is the term applied to a still later stage, in which there is so great a formation of new connective tissue that a marked increase in the size of the ovary results. It also occurs in association with uterine myomata.

(4) *Atrophic Oöphoritis.*—This is the last stage, and supervenes upon hypertrophic oöphoritis, as a result of the shrinkage of the new connective tissue. The condition is also known as *cirrhosis of the ovary*. In it, the invasion of the ovary by the new connective tissue is complete, and there is consequently a disappearance of all normal ovarian structure.

In addition to these changes in the tube and ovary, various changes take place in the surrounding structures, especially in the pelvic peritoneum. There is always a considerable amount

of pelvic peritonitis present in acute cases, and usually in chronic cases also. The result is that numerous adhesions are formed between the different pelvic organs, and also between them and the intestines. To a large extent these adhesions are beneficial, as they tend to prevent the spread of the infection into the general peritoneal cavity, should the tube or ovary rupture. It is by no means uncommon to find the vermiform appendix adherent to the

FIG. 95.—Long rectal diverticulum found in association with a double pyosalpinx. D. Diverticulum arising from pelvic colon. A. Vermiform appendix. P.C. Pelvic colon. U. Uterus.

appendages in these cases, and in a condition of chronic inflammation. Indeed it is sometimes impossible to say whether the condition of the pelvic organs has not been originally caused by an extension of an acute attack of appendicitis. In addition to the vermiform appendix, other intestinal diverticula may be found involved in the pelvic adhesions. Such a case is shown in Fig. 95, where a diverticulum some three inches in length arose from the pelvic colon and passed into the pelvis between two pus tubes. It is difficult to say how such a diverticulum originated, but it is probable that it was a very abnormally situated Meckel's

diverticulum. False diverticula may be also formed on the rectal wall by the drawing out of portions of the wall by adhesions. Such diverticula are usually nipple-shaped, and, during the separation of adhesions, the top of the diverticulum is very liable to be torn off.

In addition to pelvic adhesions, it is very common to find small collections of pus lying in loculi between the adhesions. There is also, very commonly, in these cases a slight amount of parametric thickening, especially in the layers of the broad ligament.

Symptoms.—The symptoms of salpingo-oöphoritis depend, in the first instance, on whether the condition is in an acute or chronic stage. In the acute stage, the symptoms closely resemble those of acute pelvic peritonitis. The temperature and pulse-rate are high, and the abdomen is swollen, tympanitic, extremely painful, and tender over the lower portion. The patient may also suffer from occasional rigors and vomiting. If the case is a favourable one, the acute symptoms gradually subside in from ten days to a fortnight, and the condition passes into its chronic stage. On the other hand, a general septic peritonitis may ensue due to the non-limitation of the infection by adhesions. The occurrence of abdominal pain in cases of acute pelvic infection is a sign of good import, as it usually shows that adhesions are forming, and that hence the danger of the infection spreading to the peritoneal cavity is diminishing.

In chronic cases, the symptoms are so variable that it is, as a rule, impossible to make a diagnosis by their means alone. Generally speaking, they may be said to consist of a varying degree of pelvic pain, menstrual disturbance, usually menorrhagia and metrorrhagia, and general ill-health. If both tubes are affected, sterility will result. In the case of an intermitting pyosalpinx or hydrosalpinx, an escape of pus or serous fluid into the uterus will occur at intervals. If the tumour is of large size and occupying Douglas' pouch, there may be marked constipation from pressure upon the rectum, while, if extensive intestinal adhesions have formed, there may be partial obstruction due to kinking of the intestines.

Diagnosis.—The diagnosis of acute salpingo-oöphoritis can be usually made in non-puerperal cases from the symptoms. In puerperal cases, on the other hand, the condition is very likely to be confounded with acute metritis. The pain of salpingo-

oöphoritis is more severe, and the tenderness more distributed over the entire pelvis than in metritis.

The diagnosis of chronic salpingo-oöphoritis can only be made from the results of a bimanual examination taken in conjunction with the previous history of the case. Sometimes, however, it is not possible to differentiate between small ovarian cysts and inflamed and matted-together appendages. In such cases, a diagnosis is only made when the tumour is being removed. The characteristic points of inflamed appendages are :—

(1) In cases of salpingitis without retention, the tube is felt to be thickened, and may attain the size of the middle finger. It may be coiled on itself in such a manner as to include the ovary ; both are then usually prolapsed to the bottom of Douglas' pouch.

(2) In cases of salpingitis with retention, *i.e.*, pyo- or hydrosalpinx, the tubes and ovaries, intimately connected with one another, fill Douglas' pouch. If they have reached a considerable size, the posterior vaginal fornix is displaced downwards. On passing the finger into the rectum, the tumour is felt to be cystic in parts; and, if there is an appreciable exudate in Douglas' pouch or beneath the pelvic peritoneum, the rectum will feel as if it was compressed all round by a comparatively hard and unyielding collar. This investment of the rectum is also found in cases of contracting retro-uterine hæmatocele.

(3) The tumour in Douglas' pouch is usually fixed by adhesions. In some cases, these adhesions are very easily broken down; in other cases, they are extremely dense.

(4) A groove between the tumour and the uterus can be sometimes felt from the vagina, and a groove between the two sets of appendages from the rectum.

A pyo- or hydrosalpinx has to be distinguished from the following conditions :—

(1) A tubal pregnancy, a hæmatosalpinx, a hæmatoma of the broad ligament, or a retro-uterine hæmatocele, especially one which has been partially absorbed.

(2) Small ovarian or parovarian cysts, particularly those which burrow between the layers of the broad ligaments.

(3) Subserous myomata of the posterior uterine wall, especially if they are complicated by the existence of pelvic peritonitis.

(4) Coils of intestines adherent in Douglas' pouch.

A pyosalpinx is usually, though by no means invariably, bilateral; a hæmatosalpinx, hæmatoma, or tubal pregnancy, is rarely or never bilateral. Small ovarian cysts growing in the layers of the broad ligament are extremely difficult to distinguish from cystic tubes, unless the history of the patient furnishes considerable information. Subserous myomata are closely connected with the uterus, and move readily with it.

In salpingo-oöphoritis, as in other inflammatory conditions, the blood undergoes certain changes. Two of these are of some importance for purposes of diagnosis:—*leucocytosis* and the "*iodine reaction*." Leucocytosis probably occurs to some extent in all inflammations of the tube other than those which are purely tubercular, and particularly in those associated with suppuration. While the process is acute, the leucocytic increase is likely to be considerable—15,000 to 20,000 leucocytes or more per cubic millimetre, whereas, when it has become chronic, the increase becomes less—10,000 to 12,000. The increase is chiefly of the polynuclear leucocytes, though in a long-protracted inflammation the lymphocytes may show both a relative and an absolute increase. In purely tubercular conditions there is no leucocytosis, but, as soon as secondary infection occurs, leucocytosis follows. It is usually of slight degree, up to 12,000 per cubic millimetre, and the lymphocytes are affected equally with the polynuclear cells. It must be remembered that leucocytosis, slight in degree, frequently occurs in the course of malignant disease, particularly in the case of rapidly growing tumours.

The "*iodine reaction*" is present with great constancy in all purulent conditions. It is easily demonstrated by exposing a dried smear of blood to a weak aqueous solution of iodine (1 in 300) for a few minutes; on examination, the leucocytes are found to show a brown pigmentation, either concentrated in granules or spread diffusely through the protoplasm. The reaction is absent in purely tubercular abscesses, but occurs in such varied conditions as pneumonia, puerperal sepsis, phthisis, and malignant disease.

In the application of these aids to diagnosis, care must be taken to exclude the possibility of an inflammatory or suppurative lesion elsewhere in the body. Bearing this caution in mind, they are of some help in distinguishing inflammatory from non-inflammatory pelvic lesions.

Prognosis.—Mild attacks of salpingo-oöphoritis may get well, and leave the appendages functionally perfect. More commonly, however, the inflammation subsides leaving the fimbriated extremity or the lumen of the tubes permanently obliterated, and in these cases sterility is absolute. So long as the inflammation persists, especially in cases of pyosalpinx, there is always a danger of the limiting adhesions giving way; or of the tube itself bursting, and a general peritonitis resulting. In most cases of pyosalpinx, there is attendant ill-health from the absorption of toxins, and there is a continual danger of a recrudescence of the acute stage owing to re-infection of the contents from the rectum or intestines.

Treatment.—The treatment of acute salpingo-oöphoritis is practically the same as the treatment of acute metritis. That is to say,—rest in bed, warm vaginal douches, hot applications applied over the hypogastrium, purgatives, ichthyol and glycerine plugs in the vagina—if the patient will stand the necessary manipulations, and the use of anodynes if the pain is very severe. Operative measures while the patient is in the acute stage are usually contra-indicated, on account of the danger of infecting the general peritoneal cavity, unless the patient is becoming steadily worse as the result of absorption from the tube, or unless there is a large accumulation of pus. In such cases, the pus sac should be opened from the vagina, and drained.

The treatment of chronic salpingo-oöphoritis falls under two heads:—

(A) Palliative treatment.

(B) Radical treatment.

(A) **Palliative Treatment.**—Palliative treatment consists in adopting such measures as will give temporary relief to the pain, will bring about a diminution of the inflammation, and will tend to correct the various displacements of the pelvic organs which may be present. This treatment may give satisfactory results if there are no accumulations in the tubes, and if the symptoms are not very severe, but, as a rule, it is unsatisfactory. It consists, at first, in the use of hot douches, glycerine and ichthyol plugs, and anodynes. Curetting has also been recommended, and will at any rate afford relief to such symptoms as are due to the accompanying metritis. It has even been said that it cures certain cases of salpingitis by removing the swollen mucous membrane which

obstructs the mouth of the tube, and so permitting free escape of all accumulations (Poullet). This is, however, very improbable.

Massage is also recommended, except when there is a cystic condition of the tubes. It may be of use as a means of stretching bands of adhesions, or of causing the absorption of inflammatory exudations by temporarily increasing the blood-supply. In cases of adherent retroversion of the uterus due to the accompanying pelvic peritonitis, a cure may be obtained by forcibly breaking down the adhesions by Schultze's method (*v.* page 408). Personally, however, we regard this procedure as very nearly as dangerous as radical treatment, and as by no means so satisfactory.

In cases of pyosalpinx or ovarian abscess, in which the infection is still active, it may be necessary to open into the abscess sac from the vagina, evacuate its contents, and then plug the cavity with iodoform gauze. This is a less serious operation than the total removal of the appendages, but is only palliative. If it is necessary to operate on an acute case, vaginal drainage is the best mode of procedure, as it lessens the risk of causing a general infection. The subsequent extirpation of the appendages will be, however, most probably required. In chronic cases, on the other hand, preliminary drainage is rarely necessary, and radical treatment may usually be at once adopted.

(B) **Radical Treatment.**—The radical treatment of salpingo-öophoritis consists in the adoption of one or other of the following measures:—

(1) The performance of conservative operations on the appendages, with the object of removing the diseased portion of the ovary, and of creating a new ostium to the tube if the fimbriated extremity has become obliterated.

(2) The removal of the inflamed appendages.

(3) The removal of the inflamed appendages and the uterus.

(1) A conservative operation, with the object of retaining a portion of the ovary, and of restoring the abdominal ostium of the tube, is in all cases the operation of choice, as, when successful, it leaves the patient with generative organs which are capable of functionating. It cannot, however, be successfully carried out in the presence of very advanced disease of the appendages, nor is it wise to attempt to carry it out in the presence of a still active infection. It, therefore, must be limited to cases in which active infection is not present, and in which it is possible

to remove the diseased portions of the appendages without removing the latter completely.

Conservative operations in the case of the tube consist in the restoration of its abdominal ostium—salpingostomy, in the restoration of its lumen, and in the removal of impervious portions when the lumen cannot be restored. Conservative operations in the case of the ovary consist in resection of the diseased portions, and in ignipuncture or simple puncture of small cysts. Conservatism in the case of the tubes is not so important as in the case of the ovaries, because, whilst conservative tubal operations afford the patient the chance of a future pregnancy, conservative ovarian operations act similarly and also save the patient from a premature menopause, and the various unpleasant physical and mental effects which often accompany it. It has been proved beyond doubt, that the retention of even the smallest portion of normal ovarian tissue is a factor of importance in assuring the future comfort of the patient. These operations can be carried out by the abdominal or by the vaginal route (*v.* page 487), but the abdominal route is preferable.

Whatever form of radical treatment is adopted, all intestinal adhesions must be carefully separated, the uterus freed if it is adherent, and some form of hysteropexy performed in order to prevent it again falling back and forming fresh adhesions.

(2) The removal of one or more of the appendages is necessary when conservative treatment is impossible owing to the extent of the disease, or inadvisable owing to the presence of an active infection. We must always endeavour not to remove more than is necessary. The tubes and ovaries may be removed by the abdomen or by the vagina. If the infection is still active, as shown by the persistence of pyrexia, the vaginal operation is safer, as it is not attended by the same risk of setting up a general peritoneal infection, and it should, therefore, always be performed if possible. As a rule, it will be found easier to remove the appendages by anterior than by posterior colpotomy (*v.* page 488), as the shortening of the infundibulo-pelvic ligament, which is generally present in inflammatory cases, renders it very difficult to draw the ovary sufficiently far down through the posterior fornix to permit of the ligation of the ovarian vessels. If, however, there is no reason to think that the infection is active, the abdominal route is, we think, the best, as it enables us

to discriminate more accurately between what must be removed and what can be spared.

(3) The removal of the uterus in addition to the removal of the inflamed appendages is strongly recommended by Landau, Péan, and others, on the grounds that, in cases of bilateral disease of the appendages, the uterus also is so much diseased that, if it is not removed, the patient is only half cured; and that, subsequent to removal of the appendages, its retention is not of any benefit to the patient. Our own experience shows that when complete bilateral removal of the appendages is necessary, the uterus also is so diseased as to require removal, and it also shows that complete bilateral removal is very seldom required. Our advice is to remove the uterus if its condition necessitates removal, and to do so quite independently of the condition of the appendages.

NEW GROWTHS OF THE TUBES.

The benign neoplasms of the tubes are few in number, and are not of any great clinical importance. Myoma, papilloma, adenoma, are all said to occur. A myoma of the tube is usually small and will probably not cause any symptoms. Papilloma and adenoma cause tubal enlargement which very closely resembles a pyosalpinx. An adenoma is also said to cause free fluid in the abdominal cavity (Bland-Sutton).

Such conditions can only be recognised after removal of the appendages, or during the operation itself. As their removal is the correct treatment, the diagnosis of the actual condition prior to the operation is not a matter of great importance.

The malignant neoplasms of the tubes are equally rare. Instances of primary sarcoma and carcinoma have been recorded. Secondary involvement of the tubes by extension from the uterus or ovaries may sometimes occur, but even this is not very common. If there is any reason to suspect the existence of malignant disease, an exploratory abdominal cœliotomy should be performed.

TUBERCULOSIS OF THE TUBES.

Tuberculosis of the Fallopian tubes is the commonest form of primary tuberculosis met with in women, if pulmonary

tuberculosis is excluded. It usually occurs as a primary condition, but may also be the result of extension from the uterus or from the abdominal peritoneum. Tuberculosis is the commonest cause of pyosalpinx in virgins.

Pathological Anatomy. — In most cases of salpingitis due to tubercular infection, the macroscopic appearances are not characteristic, but are very similar to those of non-tubercular salpingitis. In some cases, however, miliary tubercles are scattered over the

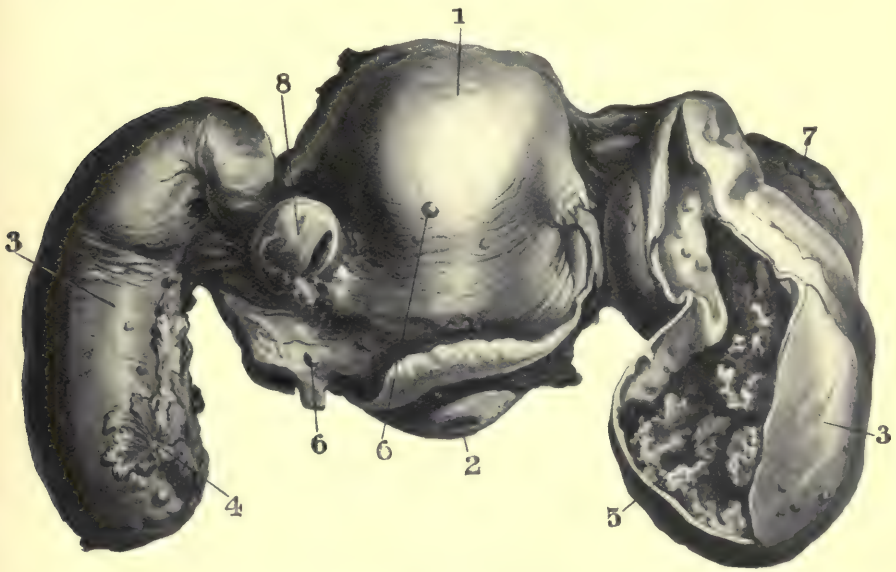


FIG. 96.—Double salpingo-oöphoritis, the result of tuberculosis. 1. Fundus uteri. 2. Cervix. 3. The distended tubes. 4. Fimbriated extremity of the left tube. 5. Right tube opened to show cheesy deposit in its interior. 6. Tubercles beneath the peritoneum. 7. Enlarged ovary on the right side. 8. Mass of breaking-down tubercular material. (*Roberts.*)

peritoneal covering, and are similar to those seen in general tubercular peritonitis. Nodules may also occur at intervals along the tube, as has been described under the head of nodular salpingitis (*v.* page 197). In cases in which the infection has started in the endosalpinx, the characteristics of endosalpingitis are present in the early stages. Later, interstitial salpingitis follows and the tube wall becomes greatly thickened and is riddled with patches of caseous degeneration and minute abscesses. The tubes usually contain pus. On microscopical examination, the changes typical of tubercular infection will be found. If the

infection was slight in extent, and the resistance of the patient considerable, the bacilli may be killed. In such cases we may find calcareous nodules scattered at intervals along the tube.

Treatment.—Tuberculous tubes should always be removed completely. The fact that their occurrence is so common is a strong reason for the early removal of all cases of pyosalpinx. If the uterus or ovaries are also involved, they must be removed as well.

TUBAL PREGNANCY.

Tubal pregnancy can hardly be said to be a disease of the tubes, though in all probability its occurrence is permitted by inflammatory conditions of the tubes associated with incomplete blocking of the ostia. As it is an obstetrical, rather than a gynæcological, condition, it will be more properly discussed in books on obstetrics.*

ABSENCE OF THE APPENDAGES.

Absence of the appendages may be the result of one of two conditions:—

(1) The absence or imperfect development of the duct of Müller on one or both sides.

(2) Torsion of the broad ligament followed by necrosis and gradual absorption of the tube and ovary.

In absence of the duct of Müller, the genital organs or anything representing them are absent. In cases of imperfect development, there is usually a fibrous cord to represent the tube.

Torsion of the broad ligament followed by absorption of the portion beyond the twist is the usual explanation brought forward to account for those cases in which during an operation or a *post mortem* examination only the stump of the tube is found. Such a case is shown in Fig. 97, which represents the condition found by us during operation on a patient who had never had a previous operation. Such cases are also said to be due to transplantation of the ovary and the tube, on the supposition that, if the ovary and tube are fixed by adhesions to an intestine, or a

* *Vide* the author's "Short Practice of Midwifery," or "Manual of Midwifery."

piece of omentum, in such a manner that the broad ligament is kept continuously stretched, their blood supply may be gradually compressed and lost, and their attachment to the uterus may atrophy and disappear.

We recently operated on a patient in whom the left ovary was adherent to the peritoneum covering the right side of the utero-vesical pouch. The only connections between the ovary and its

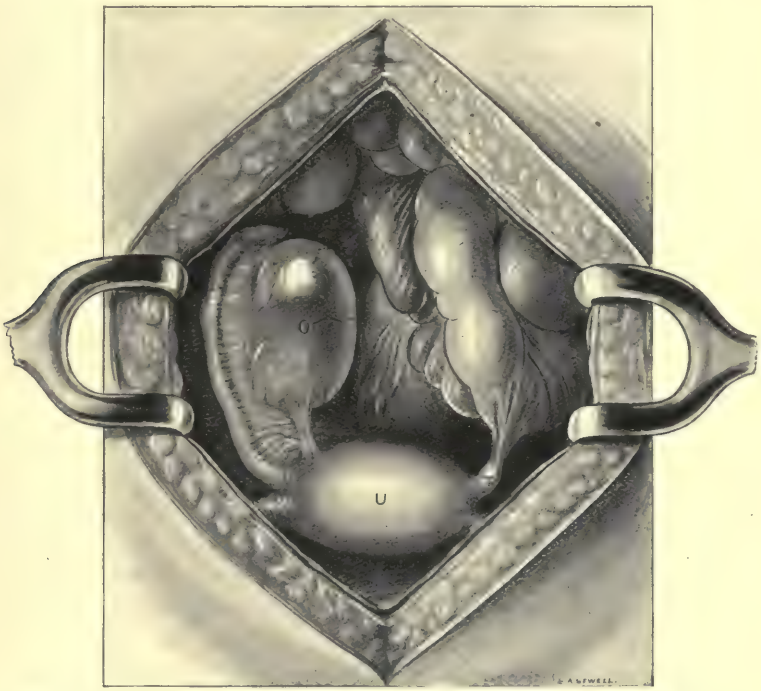


FIG. 97.—Complete absence of left appendages. T. Stump of left tube. O. Ovary containing a cyst. U. Uterus.

broad ligament were two cords, one of these was formed by the ovarian artery and ran directly into the infundibulo-pelvic ligament, the other was formed either by the tube or by another blood vessel. The ovary on section was found to be composed of three zones—an outer zone formed by a thin cortex, an intermediate zone of calcification, and a central zone containing semi-fluid detritus. It was obvious that it had almost completely lost its blood supply.

CHAPTER XI.

DISEASES OF THE OVARIES.

Displacements of the Ovaries—Undescended Ovary—Hernia of the Ovary—Ascent of the Ovary—Descent of the Ovary—Inflammatory Diseases of the Ovary—New Growths of the Ovary—Retention Cysts—Epithelial Tumours—Mesoblastic Tumours—Dermoid Cysts and Teratomata—Complex Tumours—Tuberculosis of the Ovary.

The following are the principal pathological conditions met with in the ovary:—

Displacements.
Inflammatory diseases.
New growths.
Tuberculosis.

DISPLACEMENTS OF THE OVARY.

The normal position of the ovary is thus described by Schultze:—"The ovaries lie close to the uterus on each side within the true pelvis, their long axes . . . . . parallel to the lateral wall of the pelvis, and nearly so to the median plane. They . . . . extend upwards from the uterus, their lateral attachments to the brim of the pelvis being higher than their connections to the uterus. They lie with their superior extremities in the plane of the pelvic inlet, close beneath the inner edge of the ilio-psoas muscle, which, when in momentary contraction, is the best guide for the external hand in bimanual palpation of them."

Under the head of displacements of the ovary, four conditions are included:—

(A) Undescended ovary.
(B) Hernia of the ovary.
(C) Ascent of the ovary.
(D) Descent or prolapse of the ovary.

(A) **Undescended Ovary.**—The ovaries, like the testicles, are found in the embryo close to the kidneys, from which position they gradually descend to their permanent site. The non-occurrence, or the arrest, of this process of descent gives rise to the condition known as undescended ovary, and, as a result, the latter may be found anywhere between the kidneys and the pelvic brim. As also sometimes happens in the case of non-descent of the right testicle, non-descent of the right ovary may be accompanied by a non-descended condition of the cæcum into the right iliac fossa (Bland-Sutton).

(B) **Hernia of the Ovary.**—Ovaries, either alone, or in company with the tube, intestines, or omentum, may be found in the sac of an inguinal, femoral, or obturator hernia. Hernia of the ovary alone is known as an *oöphorocele*, of both ovary and tube as a *salpingo-oöphorocele*, and of the tube alone as a *salpingocele*. Strangulation, as in the more usual forms of hernia, may occur in these cases, and hence some form of radical cure should be performed.

(C) **Ascent of the Ovary.**—Ascent of the ovary as a pathological condition is due to :—

(1) Tumours of the ovary.
(2) Tumours in Douglas' pouch, or of the broad ligament, so situated as to push the ovary upwards.
(3) Tumours of the uterus, as myomata.
(4) The formation of peritoneal adhesions round the ovary or fimbriated extremity of the tube during pregnancy, which prevent these structures from returning to their normal position as the uterus involutes.

Ascent of the ovary is not in itself a condition of any great clinical importance. Its treatment is that of the condition which causes it.

(D) **Descent of the Ovary.**—Descent or prolapse of the ovary is met with in four varieties (Mundè) :—

(1) Retro-lateral prolapse.
(2) Retro-uterine prolapse.
(3) Ante-uterine prolapse.
(4) Prolapse into the infundibulum of an inverted uterus.

The last two varieties may be dismissed, as they are only of importance from their cause. Ante-uterine prolapse is the result of the formation, and subsequent shrinkage, of adhesions which tend

to drag the ovaries into the anterior peritoneal pouch. Prolapse into the infundibulum of an inverted uterus is the occasional concomitant of the inversion, and is in itself of no importance.

The first two varieties are really only different stages in the course of the same displacement, and may therefore be discussed together. By retro-lateral prolapse is meant the descent of the ovaries into the sub-ovarian fossa. They, therefore, have not passed over the utero-sacral ligaments. By retro-uterine prolapse is meant that the ovaries are lying in Douglas' pouch, and so have passed over the utero-sacral ligaments. It is to these conditions that the term prolapsed ovary is usually applied.

Ætiology.—The causes of prolapse of the ovary fall under two heads:—

(1) Causes situated in the ovary or its ligaments. These are,—relaxation of the ligaments, and increase in the size of the ovary.

(2) Causes situated outside the ovary. These are,—retro-deviations of the uterus, pelvic peritonitis, and tumours pressing downwards.

Symptoms.—If the prolapsed ovary is associated with, or caused by, some other morbid condition, its symptoms are to a great extent masked by the symptoms of the accompanying condition. The symptoms which are the direct result of the prolapse are,—more or less well-marked dyspareunia (*i.e.*, pain during coitus), and tenderness when a vaginal examination is made, both, in proportion to the amount of inflammation which is present in the ovary. The degree of dyspareunia may be so great as to cause relative sterility by preventing coitus. There may be also extreme pain when the bowels move, or during walking.

Diagnosis.—The symptoms suggest the presence of prolapse, and then, on making a vaginal examination, a round or oval and tender swelling is found behind or slightly to one side of the uterus, either about the level of the internal os or at the bottom of Douglas' pouch. This swelling can be best felt by recto-vaginal examination, whilst by bimanual examination we can recognise that the tubes are healthy, and that one or other ovary is missing from its normal place. A prolapsed ovary may be confused with a subserous myoma growing from the posterior uterine wall, a cystic tube, a loop of intestine adherent in Douglas' pouch, and a tender retroflexed uterus.

Treatment.—The treatment consists in removing—as far as possible—any condition which may favour the prolapse of the ovary, as retro-deviations of the uterus, tumours, etc., and in adopting measures calculated to remove the accompanying inflammation—ichthyol plugs, hot vaginal douches, etc. If adhesions are present and are the cause of the prolapse, complete relief will be probably only obtained by opening the abdomen, separating the adhesions, and removing any diseased portion of the ovary. If, for any reason, an operation is contra-indicated, some relief may be obtained by means of massage. If there are small cystic tumours present, the diseased portion of the ovary or the whole ovary may be removed by vaginal cœliotomy, and adhesions broken down at the same time. An operation, having for its object the shortening of the infundibulo-pelvic ligament, was suggested by Imlach of Liverpool for cases in which the prolapse was due to elongation of the ovarian ligaments.

INFLAMMATORY DISEASES OF THE OVARY.

Inflammatory diseases of the ovary have been already fully discussed under the heading Salpingo-oöphoritis (*v.* page 203).

NEW GROWTHS OF THE OVARY.

The satisfactory classification of new growths of the ovary is by no means an easy matter, since a classification which is best from the standpoint of the pathologist, is not the most suitable for clinical purposes. In former editions of this book, we have divided new growths into two classes—cystic and solid. The cystic growths we again divided into mucoid cysts and dermoid cysts, and the solid growths into fibroma, myoma, carcinoma and sarcoma. Such a classification is fairly satisfactory, but it is capable of improvement. Accordingly, we have decided to adopt a different classification, and one which is almost identical with that adopted by Howard Kelly. This classification is as follows :—

I. Retention cysts.

II. Tumours developed from the epithelial cells of the ovary.

III. Tumours developed from the mesoblastic or connective tissue cells of the ovary.

IV. Dermoid cysts and teratomata.

V. Complex tumours.

Each of these groups will be again subdivided according to the structure of the different tumours which they comprise.

I. Retention Cysts of the Ovary.—Two varieties of retention cysts are met with, as follows:—

(A) Cysts of the Graafian follicles.

(B) Cysts of the corpus luteum.

(A) **Cysts of the Graafian follicles.**—These cysts occur in two different clinical forms, either as one or more fairly large cysts, or

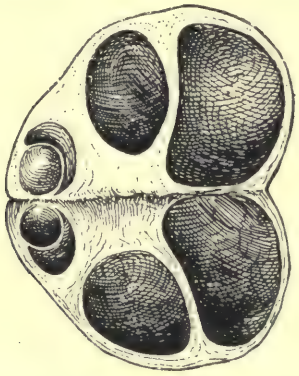


Fig. 98.—Multiple cysts of the Graafian follicles of the ovary.

as a multitude of small cysts. The larger cysts are known as simple cysts, in contra-distinction to cysts which are true new growths. Both forms are due to the accumulation of fluid in a Graafian follicle. The multiple cysts vary in size from that of a pin's head to that of a pea, whilst the larger simple cysts may reach the size of an orange, though usually they are about the size of a hazel-nut or a walnut. Their walls are identical in structure with that of the walls of a normal Graafian follicle, and they are lined with cubical or flat epithelium. The contained fluid is thin, clear, and straw-coloured, with a specific gravity of 1005 to 1026. Occasionally, it may be tinged with blood, owing to the rupture of a small blood-vessel in its walls.

The mode of origin of these cysts is obscure. The multiple

cysts are usually found in association with chronic thickening of the capsule of the ovary, *i.e.*, chronic cortical oöphoritis, and hence this condition is sometimes called "sclero-cystic oöphoritis." The larger cysts are often found in association with myomata and long continued backward displacement of the uterus, with salpingitis, and with pelvic peritonitis, and so it is probable that their occurrence is favoured by ovarian congestion.

(B) **Cysts of the Corpus Luteum.**—These cysts are formed in corpora lutea which have not ruptured, and in which the accumulation of fluid has gradually increased. They may attain the size of a walnut, or become even considerably larger, but, as a rule they are quite small. Their wall is composed of ovarian stroma, and of the peculiar golden-coloured tissue characteristic of a corpus luteum, and is very friable. Their contents are usually blood clot in different stages of disintegration, and in addition leucocytes and lutein cells. Nothing is known as to their cause.

II. Tumours developed from the Epithelial Structures of the Ovary.—Three varieties of these tumours are met with :—

(A) Cystadenoma, or proliferating adenomatous cyst.

(B) Papilloma, or proliferating papillary cyst.

(C) Carcinoma.

We shall discuss the first two together under the head of "Proliferating Cysts of the Ovary."

(A and B) **Proliferating Cysts of the Ovary.**—Cystadenoma, or proliferating adenomatous cyst, is the commonest variety of ovarian tumour. It is a benign, cystic, and multilocular tumour, which does not tend to cause metastases, to invade neighbouring structures, or to recur locally after removal. Papilloma, or proliferating papillary cyst, is also a cystic and multilocular tumour, and primarily is benign. If, however, it is not removed, it tends to invade neighbouring tissues, and to recur in them after the removal of the tumour itself. It may thus be considered to be semi-malignant. Papillomata constitute about fifteen and a half per cent. and cystadenomata about forty-four per cent. of all large ovarian tumours.

Two theories have been suggested to account for the origin of proliferating cysts :—

(1) That they are congenital in origin, and are due to the inclusion in the ovary of a cluster or clusters of germinal

epithelium, which do not go to form Graafian follicles in the ordinary manner, but are included in the ovary as "resting embryonic epithelium." This epithelium develops at a later date, and by its proliferation and secretion forms a cyst (Waldeyer, De Sinéty).

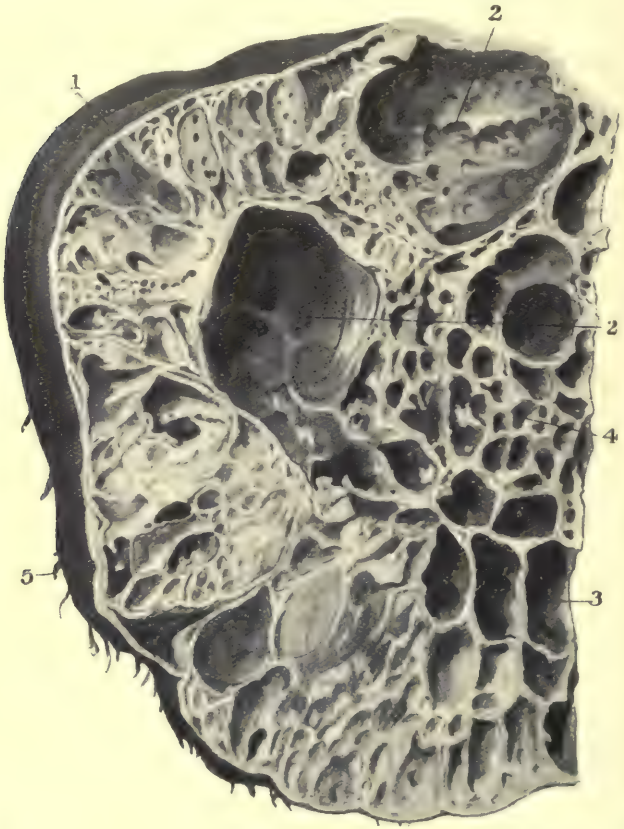


FIG. 99.—Portion of a proliferating adenomatous cyst of the ovary. 1. Outer surface of main cyst wall. 2. Large secondary cysts. 3, 4. Smaller cysts. 5. Adhesions on the surface of the main cyst. (*Roberts.*)

(2) That they have their origin in a Graafian follicle, the epithelium of which has for some reason commenced to proliferate and secrete.

The second theory affords the most probable explanation. If chance inclusions of germinal epithelium can proliferate and form a cyst, there seems to be no reason why the epithelium of the

follicle—which is derived from the germinal epithelium—should not also proliferate and be the starting-point of a cyst (Steffeck). Accordingly, it is probable that a proliferating cyst is in all cases derived from germinal epithelium, either directly, or, more usually, indirectly through the epithelial lining of a Graafian follicle. For some reason, the epithelial lining of the follicle commences to secrete fluid, this fluid accumulates, the follicle distends and becomes a cyst, the epithelium proliferates, and the result is a so-called proliferating cystic tumour of the ovary.

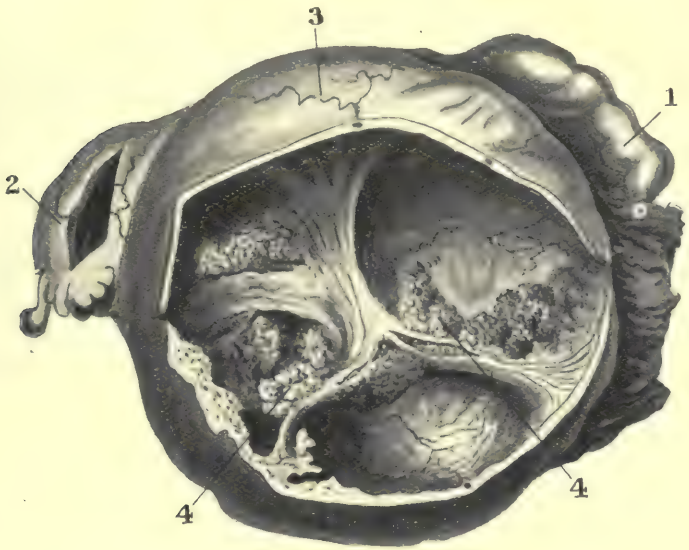


FIG. 100.—A proliferating papillary cyst of the ovary. 1. Uterine end of Fallopian tube. Below is the cut surface of the broad ligament. 2. Fimbriated extremity. The tube, which was dilated, has been opened. 3. The cyst with septa in its interior. 4. Papillomatous masses. (*Roberts.*)

It is probable that papillary cysts may sometimes arise in the degenerated remains of the glandular portion of the mesonephros (Wolffian body) which persists in the hilum of the ovary.

Proliferating cystic tumours are always multilocular, even when, to the naked eye, there appears to be only one cavity. As the epithelial lining proliferates, it may either grow outwards into the connective tissue of the cyst wall and there form diverticula (*v.* Figs. 102 and 103); or, if the activity of the epithelium is sufficiently great, it may project into the interior of the cyst in the form of little ridge-like elevations (*v.* Figs. 104 and 105). In

the former case the condition is known as *cystadenoma*, or *proliferating adenomatous* or *glandular cyst;* in the latter case, as a *papilloma* or *proliferating papillomatous cyst.*

The forms assumed by proliferating adenomatous cysts are very numerous, and constitute every degree between a smooth-walled and apparently unilocular cyst, and an almost solid tumour of a sponge-like structure. Without going into a full description of them, it may afford some assistance in under-

FIG. 101.—A proliferating papillary cyst of the ovary, in which the papillary masses have made their way through the cyst wall. 1. Remains of ovary partially converted into a cyst, which has burst. 2. Cystic portion of ovary, its interior is filled with papillomatous growth. 3. Papillomatous masses in which the ovary is embedded. Many of these have sprouted through the cyst wall. 4. Pedicle. (*Roberts.*)

standing them to give, shortly, the factors which determine so great a variety of forms:—

(1) If the rapidity of cell secretion and of serous transudation is greatly in excess of the rate at which the epithelium proliferates, a cyst is formed, with thin and smooth walls, which is only distinguishable from a simple cyst by the facts that it is usually much larger, and that, if carefully examined, smaller cysts will be seen in its walls. If the walls are examined microscopically, the epithelium which usually lines the interior of these cysts may be found to be

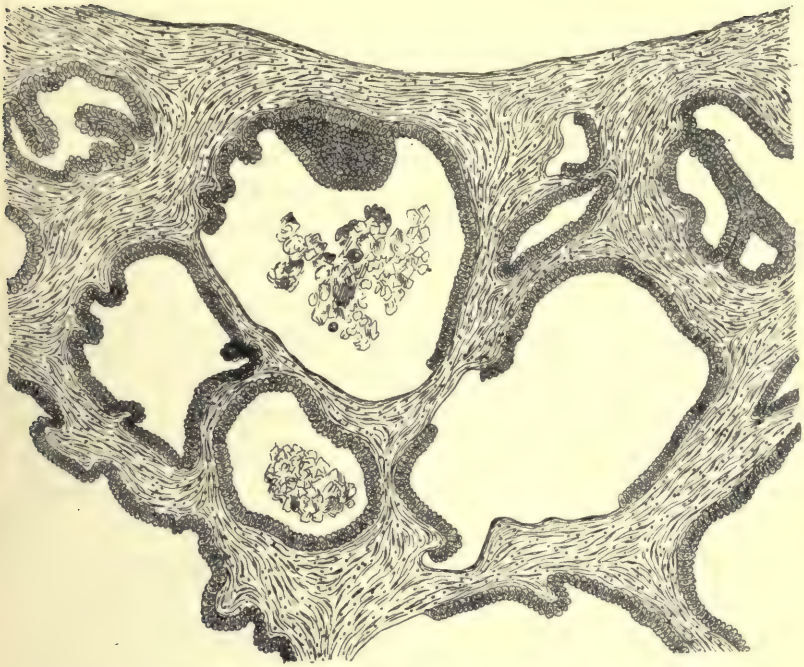


FIG. 102.—Proliferating adenomatous cyst of the ovary. Diagrammatic section through the wall. (*Wyder.*)

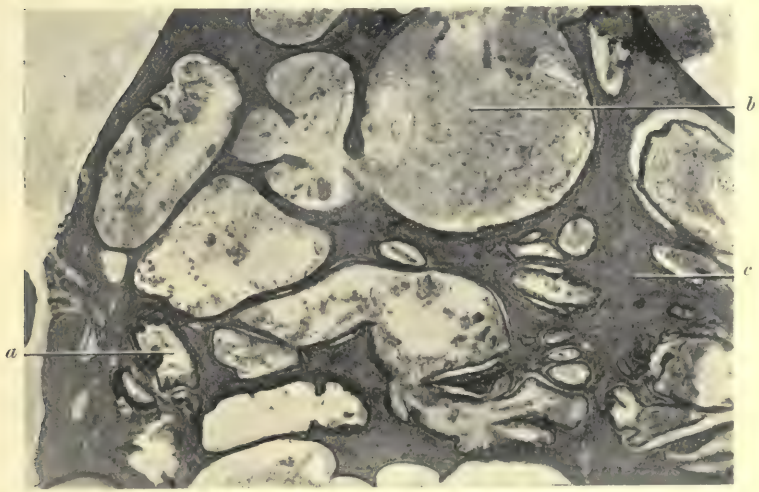


FIG. 103.—Proliferating adenomatous cyst. *a*. Small space whose wall is lined with columnar epithelium. *b*. Larger space, the wall lined with flattened epithelium. *c*. Interstitial connective tissue. (*Wigham.*)

completely wanting, or to have disappeared in parts. This, and the fact that the cyst is usually composed of one large cavity, are due to what may be called pressure atrophy, *i.e.*, atrophy of the cells, and of the dividing septa between the different loculi of the cyst, owing to the pressure exerted upon them by the fluid.

(2) If the cellular proliferation proceeds at a quicker rate than does the accumulation of fluid, then the proportion of cyst wall

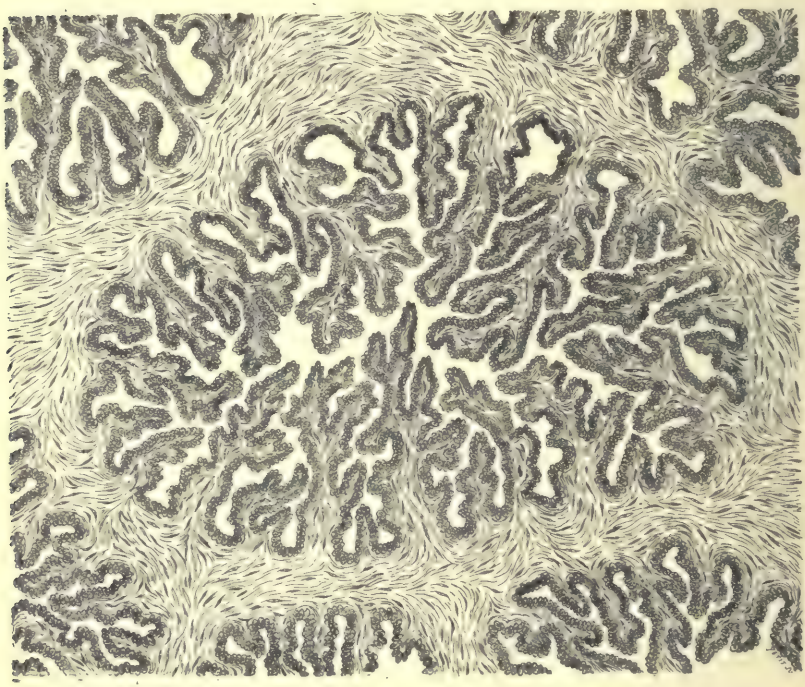


FIG. 104.—Proliferating papillary cyst of the ovary. Diagrammatic section through the wall. (*Wyder.*)

to fluid contents is increased, and a multilocular tumour is formed, in which comparatively thick walls separate cavities of various sizes, and are themselves honeycombed with still smaller cavities.

The following sentence describes this condition very well :— "Secondary pouches (with fluid contents) form on the surface and in the walls of the large cyst ; secondary and tertiary generations grow out, masses of areolar tissue add themselves

here and there, and so come to render more complex this singular variety of ovarian degeneration. According as the amount of areolar tissue, and the number, size, and distribution of the pouches are varied, so all the different forms which have been described are obtained " (Quénu).

(3) If the activity of the cells lining the interior of the cyst is considerable, the fluid will be thick and ropy owing to the presence of pseudo-mucin. If, on the other hand, their activity

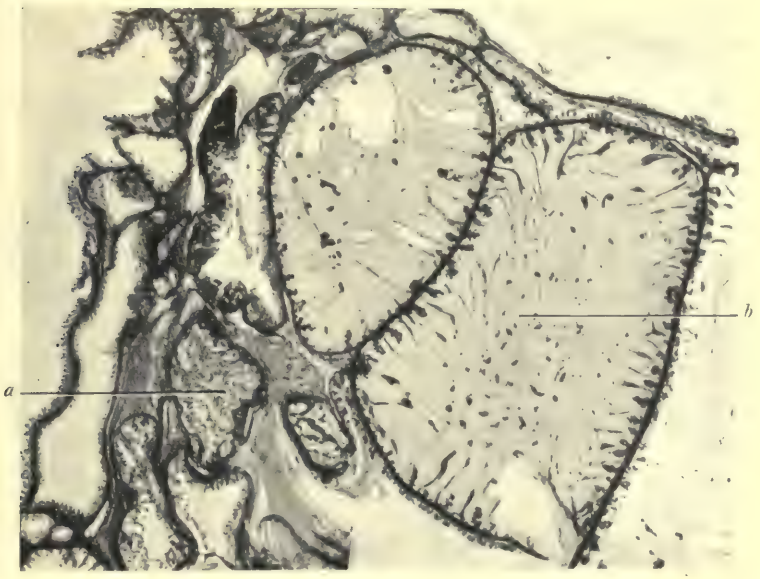


FIG. 105.—Proliferating papillary cyst. *a*. Cystic space filled with papillary tufts of epithelium. *b*. Space showing papillary tufts of epithelium, and filled with mucoid material. (*Wigham.*)

is slight and the accumulated fluid is, in the main, the result of serous transudation, the fluid will be thin and limpid, and contain no pseudo-mucin. As a rule, it is also found that a lining of cylindrical ciliated epithelium is associated with thin and limpid contents, a lining of cylindrical non-ciliated epithelium with thick and mucus-like contents (Gebhart).

Proliferating papillary cysts are luckily much rarer than proliferating glandular cysts. The essential difference between them is, that in the papillary cyst the activity and power of growth of the epithelium is very much more marked than in the

glandular cyst. This results in the outgrowth of epithelial vegetations through the cyst wall, and in the great tendency to take on malignant action which these cysts possess. The variations in form and size are also very numerous, but they do not reach the enormous size which is sometimes reached by adenomatous cysts. The papillary groups of epithelial cells, which first appear on the interior of the cysts, afterwards tend to grow

FIG. 106.—Carcinoma of the ovary, probably malignant degeneration of a pre-existing ovarian cyst.

outwards on to the exterior, and from it they may invade the peritoneum (*v.* Fig. 101). From the commencement of peritoneal invasion, the history of the case is one of malignant disease.

(c) **Carcinoma.**—Carcinoma of the ovary, as a primary condition, is by no means so uncommon as is sometimes stated. It is the most common form in which malignant disease attacks the ovary, and not infrequently arises in a mucoid cyst. In many cases, however, it is secondary to carcinoma of the breast, the

uterus, and the pylorus or some other portion of the gastro-intestinal tract; in such cases both ovaries are likely to be affected (Bland-Sutton).

For a long time, there was no satisfactory explanation for the connection which undoubtedly exists between mammary and ovarian cancer. Recently, however, Hanley has shown that mammary cancer extends through the lymphatics of the deep fascia until it reaches the epigastrium just below the ensiform cartilage. Thence it extends through the sub-peritoneal tissues and peritoneum into

FIG. 107.—Carcinoma of the ovary. Section of the companion ovary to that shown in Fig. 106.

the general peritoneal cavity, which is thus infected. Cancer cells are set free from these intra-peritoneal metastases, and, under the influence of gravitation, helped by fluid in the peritoneal cavity, fall into the pelvis and alight upon and infect the ovaries. We are not aware that Hanley suggests any reason to account for the more frequent infection of the ovaries than of any of the other pelvic contents. An obvious explanation, however, can be found in the periodical ruptures which occur in the cortex of the ovary during ovulation. If the cancer cells were to fall into a ruptured Graafian follicle, they would be provided with a very

suitable nidus for further development. Bland-Sutton, who endeavours to establish the secondary character of all, or almost all, cases of ovarian cancer, suggests a similar mode of extension from gastric cancer to the ovaries. Whilst we think that Hanley's explanation satisfactorily accounts for the spread of the cancer in the cases in which ovarian cancer is secondary to cancer elsewhere, we are unable to accept Bland-Sutton's view that so-called "primary" ovarian cancer is almost always secondary, nor, so far as we can ascertain, is this view accepted by the majority of operators or of pathologists. At the same time, he has undoubtedly performed a valuable service in directing attention to the fact that a primary focus elsewhere may, and often does, exist, and that it is very liable to be overlooked. Cancer, either primary or secondary, constitutes about fifteen and a half per cent. of all cases of large ovarian tumours.

III. Tumours developed from the Mesoblastic Cells of the Ovary.—Four varieties of tumour developed from the mesoblastic or connective tissue cells are met with:—

(A) Fibroma.
(B) Myoma.
(C) Sarcoma.
(D) Endothelioma.

(A and B) **Fibroma and Myoma.**—The fibroma and the myoma are both rare tumours in this region, especially the myoma. Fibromata constitute about six per cent. of all large ovarian tumours. They vary in size from quite a small nodule to the size of a fœtal head, and sometimes occur in association with cystadenoma. A myoma of the ovary consists of unstriped muscle tissue with which there may be a mixture of fibrous tissue. Both tumours are encapsuled, and in this way may be distinguished from sarcoma which infiltrates the ovary.

(C) **Sarcoma.**—Sarcoma of the ovary may occur between infant life and puberty, and also between the ages of twenty-five and forty-five (Bland-Sutton). In adults it constitutes about three per cent. of all large ovarian tumours. It may reach a comparatively large size, and is usually composed of a mixture of spindle and round cells. If one ovary is affected, the other will probably be also attacked. Sarcoma rapidly generalises itself and proves fatal. Cystic degeneration of these growths is very

common, and, frequently, hæmorrhages take place into the cavities thus formed.

(D) **Endothelioma.**—Endothelioma of the ovary, like that of the uterus, may occur in either of two forms, originating respectively from the lymph canals of the organ or from the peritoneal covering. The appearances are similar to those described in the case of the uterus (page 181). The accompanying figure shows a peritoneal endothelioma (*perithelioma*), which caused widespread dissemination throughout the entire peritoneal cavity. Each of the grape-like bodies consisted of large and flat cells, indistinguishable from and continuous with those of the peritoneum covering them. In the middle of each nodule was a small cyst-like cavity, which contained clear lymph; the wall of

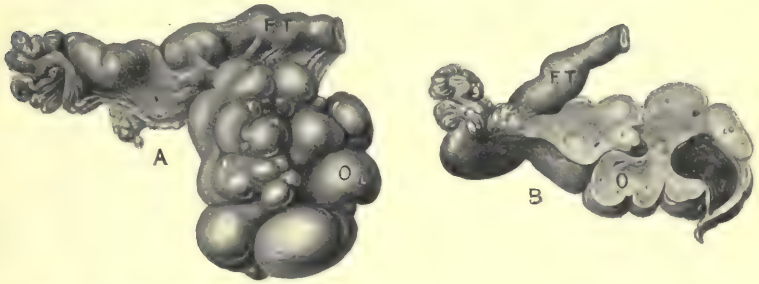


FIG. 108.—Endothelioma of the ovaries. A. Right ovary. B. Left ovary seen in section. F.T. Fallopian tube. O. Ovary.

the cavity was not specialised in any way. There was very little stroma. The secondary growths were small nodules, not unlike miliary tubercles in appearance, but identical in structure with the grape-like bodies. The condition had given rise to considerable ascites.

IV. DERMOID CYSTS AND TERATOMATA.—A dermoid (δέρμα, the skin; εἶδος, a likeness) cyst is characterised by possessing a lining of cells derived from ectodermal cells, and by containing a heterogeneous collection of other ectodermal structures, as hair, teeth, sebaceous glands, and nails, and, in addition, traces or even large quantities of tissues resembling almost any of the structures of the body (*v.* Fig. 109). Amongst these may be mentioned cartilage, bone, mucous and mammary glands, and smooth muscle-fibre. Their fluid contents are composed of a

yellow and greasy substance containing sebaceous matter, shed epithelium, and fat. As the tumour loses its heat after removal, the fluid solidifies. Dermoids are usually of a comparatively

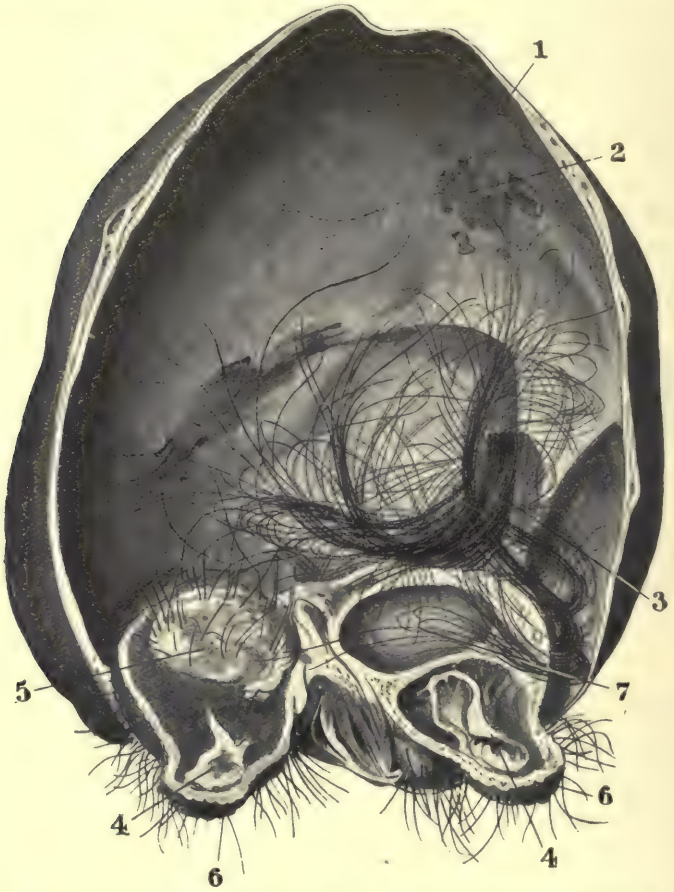


FIG. 109.—A dermoid cyst of the ovary. 1. Main cyst wall. 2. Plates of calcareous material. 3. Long masses of hair. 4. Bony plate contained in nipple-like processes, which have been cut in half. 5. Pad of fatty material fitted into a hollow (7) on the opposite side. 6. Extremity of the so-called nipple, covered with true skin and hair. (*Roberts.*)

small size, and rarely exceed that of a fœtal head. They are usually unilateral, but may be bilateral.

Several theories have been brought forward to explain the origin of dermoid cysts:—

(1) That they are due to the inclusion of a portion of ectoderm

in the ovary, at a time at which the latter lies close to the former (Verneuil, Lannelongue). This theory, while it serves to account for the presence of ectodermal structures in these tumours, does not in the least account for the presence of the various structures which are not ectodermal in origin.

(2) That they are instances of parthenogenesis (ovular development without impregnation), that is to say, that an ovule takes on growth *per se* and develops an atypical incomplete embryo,

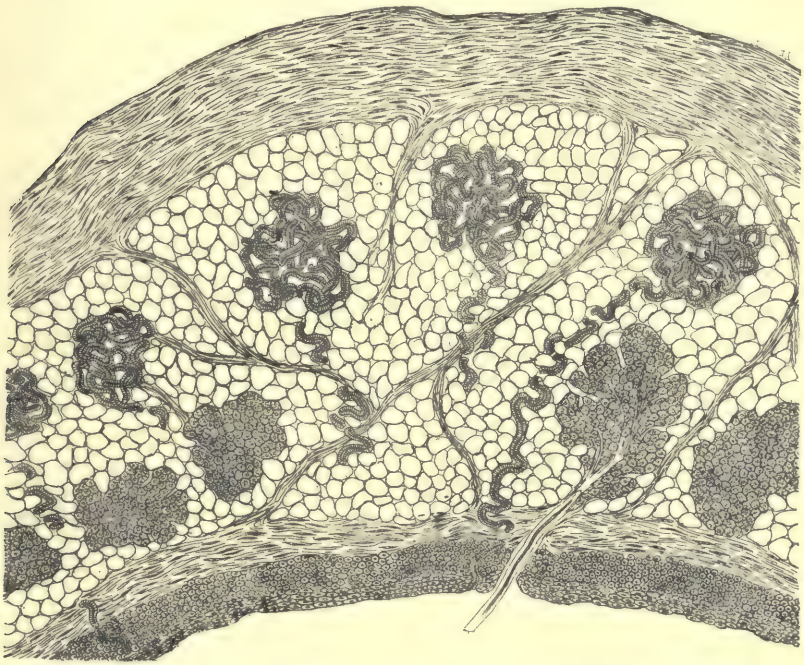


FIG. 110.—Dermoid cyst of ovary. Diagrammatic section through the wall. (*Wyder.*)

in which many of the ordinary tissues of the body are represented whilst others are not, such tissues being arranged in no recognised order but grouping themselves haphazard (M. Duval). In support of this theory, it is urged that parthenogenesis is a common occurrence in lower orders of insect life, and that, if the process is continued for too many generations, the offspring deteriorates; that segmentation without fertilisation has been observed in the ovule (Morelle); and that a very small dermoid tumour has been seen in the centre of a Graafian follicle (Steinlin). Such a theory

helps to explain those cases in which mixed proliferating and dermoid tumours are found, as they can then be explained by assuming that there was proliferation of the epithelium of a Graafian follicle in which a dermoid tumour was developing.

(3) That a dermoid is derived from a cell called a "nodal cell," which has been lying latent up to the time of the formation of the tumour. Bard, who was the originator of this theory, applies the term "nodal cell" to the cells of the ovule prior to the differentiation of the three layers of the embryo. As these layers are derived from "nodal cells," each cell must apparently have the power of developing different tissues. Such a theory would also explain those cases in which dermoids, containing tissues other than ectodermal, have been found in parts of the body other than the ovary.

A teratoma is a solid tumour which contains elements very similar to those met with in a dermoid cyst, but these elements are more irregularly arranged and are distinctly malignant in type (Kelly). The teratomata stand in relation to dermoids in a position analogous to that held by the carcinomata in relation to cystadenomata (Gebhard). Dermoid cysts constitute about sixteen per cent. of all large ovarian tumours, whilst teratomata are exceedingly rare.

V. Complex Tumours.—Complex or mixed tumours are formed by the association of different varieties of tumour in the same growth, as by the association of a proliferating tumour and a fibroma.

Symptoms.—The principal symptoms caused by ovarian tumours are as follows :—

(1) Menstrual disorders. These are very variable. Most frequently, there is slight menorrhagia and metrorrhagia, and dysmenorrhœa; more rarely—in those cases in which the ovarian tissue is completely destroyed—amenorrhœa.

(2) Pressure symptoms. The extent of the pressure symptoms depends upon both the size and the situation of the tumour. Very large tumours cause serious pressure upon the heart, lungs, stomach, and intestines, and so give rise to cardiac palpitations and perhaps failure, dyspnœa, vomiting, and intestinal atony. Smaller tumours, on the other hand, which become

impacted in the pelvic cavity, may cause severe pain from pressure upon the sacral nerves, and interference with the functions of the bladder and rectum. In malignant disease of the ovaries, ascites is very commonly present.

(3) Constitutional disturbances. These consist in the occurrence of dyspepsia, debility, insomnia, and other reflex disorders.

Diagnosis.—A small ovarian tumour has to be distinguished from cystic enlargement of the tube and subperitoneal myomata of the uterus. The diagnosis as a rule can be best made by a bimanual examination, unless the tumour is very small, when it can be best made by an abdomino-recto-vaginal examination. The characteristic signs of a small or medium-sized ovarian tumour are as follows:—

(1) A tumour is felt, distinct from the uterus but connected with it by means of a pedicle, and situated in the neighbourhood of one or other ovary.

(2) The ovarian ligament runs into the tumour (*v.* Fig. 111).

(3) An ovary can be felt on one side, and only the tumour on the other.

In the case of a large tumour which fills the entire abdomen, it is more difficult to arrive at a correct diagnosis. Such a tumour may be confounded with a fibro-cystic tumour of the uterus, a pregnant uterus, a collection of ascitic fluid, a large cystic kidney, an enlarged spleen, and an extra-uterine pregnancy at or near full term. The diagnosis of a large ovarian tumour can be made by noting the following points:—

(1) The history of the case shows that the tumour has grown upwards from the pelvic brim, and not downwards from the region of the kidney or spleen. Tumours of renal or splenic origin grow downwards.

(2) The outlines of the tumour are distinct, and, if the abdomen is percussed, it will be found to be dull in the centre and resonant round the sides. In ascites, there is no well-marked outline unless the fluid is encysted, and the sides of the abdomen are usually found to be dull while the centre is resonant.

(3) As in the case of a small cyst, the most reliable point is that the tumour is distinct from the uterus, but connected with it by means of a pedicle. The pedicle of an ovarian tumour can usually be felt in the following manner:—Catch the cervix in

an American forceps, and insert the middle finger into the rectum and the index finger into the vagina. Get an assistant to draw the uterus well down within reach, and pass the rectal and vaginal fingers upwards at one or other side of the uterus, in such a manner, that they enclose the broad ligament between them. Lastly, get an assistant to push the tumour upwards towards the diaphragm. The fingers will then feel the pedicle tightening—if there is one, and, when the assistant allows the tumour to fall back again, the pedicle will be felt relaxing. The determination of the fact that the tumour is distinct from the uterus will at once

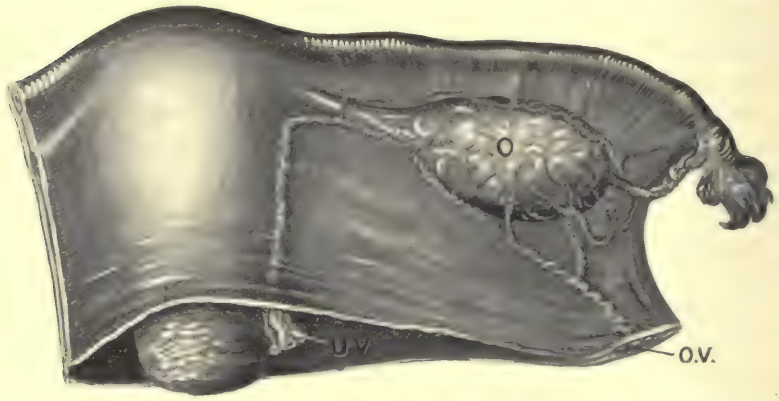


FIG. 111.—Posterior view of the broad ligament, showing the blood-supply and the attachments of the ovary. O. Ovary. O.V. Ovarian vessels entering through the infundibulo-pelvic ligament. U.V. Uterine vessels.

exclude the possibility of intra-uterine pregnancy, and will almost exclude the possibility of a fibro-cystic tumour of the uterus.

If it is not possible to separate the tumour from the uterus, even when the examination is made under an anæsthetic, pregnancy and fibro-cystic tumours must be excluded as far as possible by the symptoms of the patient. This as a rule is easy to do in cases of pregnancy, in which the differential diagnosis is most important. In cases of doubt, a positive diagnosis can always be obtained by waiting. Fibro-cysts of the uterus are more difficult to distinguish, but, in their case, an accurate diagnosis is not so important and doubts can be removed by an exploratory cœliotomy. This remark applies also to cases of extra-uterine gestation after term ; before term, the symptoms of the case are usually sufficient.

The diagnosis of the actual nature of an ovarian tumour can only be made after its removal, and though in many cases it may be possible to make such a diagnosis by macroscopical examination, still a certain diagnosis can only be made by routine microscopical examination. Such an examination should therefore be carried out in all cases.

Prognosis.—The prognosis of ovarian tumours, which are not removed, is very bad, except in cases of benign solid tumours such as fibromata. In all other cases, the death of the patient will almost certainly result from one or other of the following causes:—

(1) The pressure which the tumour exerts on vital organs, notably on the heart, causing its failure; on the intestines, causing obstruction; on the ureters, causing uræmia; on the lungs, causing impeded respiration and œdema.

(2) The toxic effect which the absorption of its contents may have.

(3) Putrefaction or suppuration occurring in the tumour. These changes may occur either with or without twisting of the pedicle.

(4) Rupture of the cyst wall and consequent fatal peritonitis or hæmorrhage.

(5) Obstruction of labour, so causing rupture of the uterus.

(6) The occurrence of metastases, if the tumour is malignant, in other organs or on the peritoneum.

(7) The occurrence of malignant change in tumours which were primarily benign.

Papillary cysts of the ovary are, with the exception of actual malignant growths, the most dangerous of ovarian tumours, because, once the papillary masses have burst through their capsule, the rest of the history of the case is similar to that of malignant disease.

Treatment.—All tumours of the ovary must be removed, as it is impossible to determine whether they are of a harmless nature, or not, without doing so. Removal may be effected in the case of small cysts through the vagina (*v.* page 484), in the case of large cysts through the abdominal wall (*v.* page 480). The only form of ovarian cyst, which may be left alone with safety, is a retention cyst. It is, however, impossible to tell with certainty that a cyst is a retention cyst without removing and examining it carefully.

Aspiration of the contents of ovarian cysts, as a means of affording temporary relief or even of effecting a cure, is a practice which is not infrequently adopted, although it has been condemned by all modern writers and operators. Aspiration, or tapping, never effects a cure. On the contrary, if the tumour is malignant, it renders dissemination of its contents through the peritoneal cavity more likely. Further, every time a cyst is tapped, adhesions may be formed between the cyst and the abdominal wall; and so a case, which at the commencement may have been uncomplicated, may be rendered most complicated. Tapping of a cyst is only permissible under one condition:—If a patient is dying from cardiac failure due to the pressure of a cyst, tapping may be resorted to with the object of removing the urgent symptoms and bringing the patient into a condition more suitable for operation. Tapping of the peritoneal cavity may be sometimes necessary, in cases complicated by ascites, in order to facilitate diagnosis.

TUBERCULOSIS OF THE OVARY.

Tuberculosis of the ovary very rarely occurs as a primary condition, and is usually secondary to tuberculosis of the tubes (*v.* Fig. 96), of the peritoneum, or, more rarely, of other organs, as the lungs. Even then, it is rare, and in extensive tuberculous disease of the tubes, the ovaries may be quite free from infection. When ovarian tuberculosis occurs, it usually results in the formation of an ovarian abscess.

The symptoms, methods of diagnosis, and treatment, are the same as those of salpingo-oöphoritis (*v.* page 206).

CHAPTER XII.

DISEASES OF THE PELVIC PERITONEUM AND OF THE UTERINE LIGAMENTS.

Pelvic Peritonitis: Pathological Anatomy, Bacteriology, Symptoms, Prognosis, Treatment—Pelvic Cellulitis: Pathological Anatomy, Symptoms, Diagnosis, Prognosis, Treatment—Tumours of the Broad Ligament—Cysts: Fibroma—Hæmatoma—Tumours of the Round Ligament—Cysts—Fibroma.

PELVIC PERITONITIS.

Pelvic peritonitis is the term applied to inflammation of the pelvic peritoneum. It is also known as perimetritis, when the inflammation affects the peritoneum covering the uterus or the broad ligaments.

Ætiology.—Pelvic peritonitis is always present in salpingo-oöphoritis, as a result of the extension of the tubal infection to the peritoneum. In other cases the source of infection may be the intestinal canal, or perforating wounds of the uterus or vagina, or, possibly, any part of the pelvic connective tissue, the extension taking place by means of the lymphatics. It is, however, doubtful whether infection, travelling through the lymphatics of the broad ligament, sets up peritonitis or not. In all probability it does not do so, but rather causes inflammation of the connective tissue, *i.e.*, cellulitis (Widal).

Pathological Anatomy.—As a consequence of infection, an exudate of lymph is poured out on the surface of the peritoneum, and adhesions form in all directions between opposing surfaces. As a result, the intestines become adherent to one another, to the uterus, and to the appendages; while the uterus and appendages become glued together and to the peritoneum of Douglas' pouch. If the infection is acute, pus may form, and, collecting in the interspaces between the adhesions, may lead to accumulations of very considerable size. Such accumulations may burst either externally, or into the vagina, uterus, bladder, rectum, or

intestines. As the inflammation subsides, the adhesions contract and become firmer, and in this way fixed malpositions of the uterus and fixed ovaries are produced.

Bacteriology.—The micro-organisms which are commonly found in pelvic peritonitis are the Gonococcus, Streptococcus Pyogenes, Staphylococcus Pyogenes Aureus and Albus, and the Bacillus Coli Communis. Dudgeon and Sargent, who have investigated the bacteriology of peritonitis very carefully, consider that "certain bacilli of the Coli group are the most important, the most common, and not infrequently the most virulent of the organisms which are known to cause peritonitis." This view is not generally accepted, and most gynæcologists, we think, will attribute more deadly powers to the Streptococcus Pyogenes and the Staphylococcus Pyogenes Aureus. The Staphylococcus Pyogenes Albus is very commonly present in pelvic peritonitis, and according to Dudgeon and Sargent exerts a protective action in cases where other organisms are also present. This action, they consider, is caused by the advent of phagocytes to the inflamed part, and the formation of limiting adhesions. This organism is also undoubtedly the cause of small localised infections, such as those occurring in the abdominal wall after operations on suppurative conditions in the pelvis. The Gonococcus can cause a diffuse or a localised peritonitis. Its degree of pathogenicity is low, and the resulting peritonitis is usually correspondingly slight.

Symptoms.—The symptoms caused by acute and localised pelvic peritonitis are almost the same as those caused by acute salpingo-oöphoritis. The symptoms of the chronic stage are due to the displacements, which the contraction of the adhesions causes. Thus, there may be the symptoms of chronic metritis, from the displacement of the uterus; irritability of the bladder, from the traction exerted upon that organ by contracting bands; sterility from occlusion of the abdominal ostia of the tubes; flatulence, and a greater or less degree of obstruction of the intestines, from constricting bands; and ovarian tenderness, or pain, from pressure on the ovaries.

Prognosis.—The prognosis of pelvic peritonitis in its acute stage is somewhat serious, on account of the risk of the infection extending to the general peritoneal cavity. Even after the acute stage has passed away, its return may occur at any time. In

the chronic stage, pelvic peritonitis does not as a rule endanger life, except in rare cases by causing intestinal obstruction. The patient, however, seldom completely recovers from an attack, as the adhesions and their effects persist, causing a varying degree of discomfort or pain.

Treatment.—The treatment of acute pelvic peritonitis consists in keeping the patient at rest in bed, adopting measures to relieve the pain, and promoting the peristalsis of the intestines. The pain may be best relieved by the application of hot stupes over the hypogastrium, or sometimes of an ice-bag, by warm vaginal douches, and by the insertion in the vagina of glycerine and ichthyol plugs. Leeches, and dry-cupping over the lower portion of the abdomen are also recommended. If accumulations of pus form in Douglas' pouch or amongst the intestines, they must be opened, if possible through the vagina. If this cannot be done, and if it is necessary to open the abscess from above, sufficient time must be allowed to permit of the formation of adhesions between its wall and the abdominal walls in order that it may be possible to open the sac without at the same time opening the general peritoneal cavity.

In the chronic stage, relief may be afforded to the symptoms by the same palliative measures as give relief in salpingo-oöphoritis (*v.* page 209). The radical treatment of this stage consists in the removal of the cause of the peritonitis, such as inflamed ovaries or tubes, suppurating tumours, etc., and in the breaking down of adhesions, with a view to correcting the malpositions which they cause. These proceedings can be carried out after opening into the peritoneal cavity either by the vaginal or the abdominal route.

As a rule, it is advisable to commence in chronic pelvic peritonitis with palliative treatment, but, if this fails to relieve the pain, and if a year has elapsed since the acute stage, it is advisable to open the abdominal cavity with a view to making an exact diagnosis. If this is done, adhesions can be broken down, diseased appendages removed if necessary, and ventral or vaginal suspension of the uterus performed.

We prefer the abdominal route in these cases, as it enables intestinal adhesions to be dealt with more satisfactorily, and also permits of the more exact removal and repair of diseased tissues. Operating by the vaginal route, it is more difficult to determine

exactly what must be removed and what may be spared, and therefore, as a rule, a more extensive removal of the appendages has to be carried out than is desirable. At least a year is the shortest time which ought to elapse between the end of the acute stage and any intra-abdominal operation, in order that we may be sure that the invading bacteria have disappeared, and that the risk of our lighting up an acute infection is over. Operation after a shorter interval is never safe on account of this risk, but, if all symptoms of infection have been absent for this period, we may consider that operation is safe so far as the danger of an old infection is concerned.

PELVIC CELLULITIS.

Pelvic cellulitis is the term applied to inflammation of the subperitoneal pelvic tissue due to infection, either directly, or from an already infected area through the lymphatics. When it is limited to the subperitoneal tissue in the neighbourhood of the uterus or broad ligaments, it is sometimes termed parametritis. It is most usually secondary to septic or gonorrhœal endometritis, especially when such a condition starts after parturition. It also occurs from traumata, such as deep lacerations of the cervix and wounds of the vaginal vault, which open the pelvic tissue to infection.

Pathological Anatomy.—Two forms of pelvic cellulitis may occur:—a diffuse form, in which the infection extends rapidly through the entire pelvic connective tissue; and a circumscribed form, in which the infection remains limited to one portion of the connective tissue. In the former case the infection is usually more virulent, the entire pelvic tissue becomes infiltrated by an exudate of small leucocytes and sero-purulent fluid, and, as this exudate increases in amount, the uterus becomes so fixed that it seems to be embedded in plaster of Paris. In the circumscribed form, the exudate is limited to one or other side of, or in front of or behind, the uterus, and, according to its situation, is spoken of as anterior, posterior, or lateral parametritis. In each form, the exudate may follow one of two courses:—it may be absorbed, or suppuration may take place. In those cases in which absorption occurs, a certain degree of

infiltration and of cicatricial contraction of the uterine ligaments persists, leading to subsequent displacements of the uterus (*v.* page 111 and Fig. 44). If an abscess forms, it opens most frequently above Poupart's ligament. It may also open through the ischial foramen, at the outer margin of the quadratus lumborum, below Poupart's ligament, or into the vagina, bladder, or rectum (Dührssen).

Symptoms.—The symptoms are very similar to those of the acute stage of pelvic peritonitis. If, as sometimes happens, the sheath of the ilio-psoas muscle is involved, the patient when in bed will lie with the thigh on the affected side flexed, in order to relax the muscle as far as possible. If pus forms, the temperature becomes hectic in character, and night sweats and rigors occur. In the chronic stage, the symptoms are due to the displacements which are brought about by the cicatricial contraction of the ligaments.

Diagnosis.—The diagnosis is made from the symptoms, taken in conjunction with the results of a pelvic examination. The uterus is found to be surrounded by a firm immovable mass, or else to be displaced to one or other side by such a mass. If the exudate is situated in the tissue at the base of the broad ligament, the vagina seems to be roofed over by the exudate. If the exudate is principally in the layers of the broad ligament, a hard mass can be felt by abdominal palpation, on one or other side of the uterus. A unilateral cellulitis, especially if situated in the layers of the broad ligament, is very likely to be mistaken for a suppurating hæmatoma, if one depends on the physical signs alone. The diagnosis is made from the history.

Prognosis.—A diffuse cellulitis may kill the patient by setting up a general septic poisoning—such a termination is, however, rare, or, if an abscess forms, by bursting into the peritoneal cavity. Sometimes the exudate may be absorbed, and leave behind no very palpable trace of its existence. More generally, however, there will be some displacement of the uterus caused by cicatricial contraction of the ligaments.

Treatment.—The treatment of pelvic cellulitis resembles the treatment of the other acute inflammations of the pelvis—rest in bed, hot stupes, hot vaginal douches, the use of opiates if necessary, and the administration of easily digested and nourishing food, stimulants, and laxatives. If an abscess forms, it will tend

to point in one of the places already mentioned. If possible, that is, if the abscess is situated in the base of the broad ligament, or beneath the peritoneum of Douglas' pouch, it must be opened from the vagina. If it is bulging upwards into the abdomen, and tending to point above, its sac must be allowed to become adherent to the abdominal walls before opening it. After the contents have escaped, it is advisable to make a counter-opening into Douglas' pouch from the vagina in order to allow free drainage (*v.* page 506).

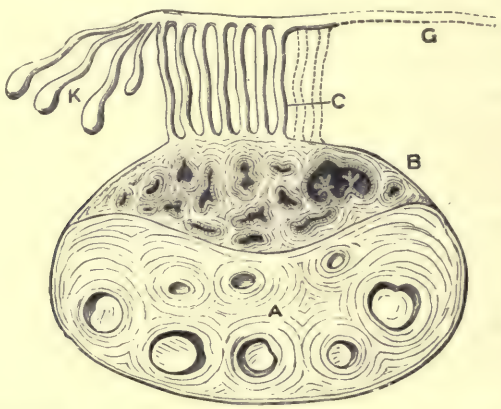


FIG. 112.—Diagram of the ovary and parovarium showing the relationships of the oöphoron and par-oöphoron. A. Oöphoron. B. Par-oöphoron. C. Vertical tubules of parovarium. K. Kobelt's tubes. G. Gärtner's duct. (*Bland-Sutton.*)

TUMOURS OF THE BROAD LIGAMENT.

CYSTS.—Cysts of the broad ligament arise in the parovarium (*παρά*, beside ; *ovarium*, an egg-keeper) or Organ of Rosenmuller, which is the remains of the Wolffian body. The parovarium consists of three sets of tubules :—an outer set, about three in number, running vertically to the outer extremity of the broad ligament and sometimes ending in small pedunculated cysts (the hydatids of Morgagni)—these are known as Kobelt's tubes ; an inner set of about twelve in number, also running vertically and radiating from the par-oöphoron ; and, lastly, a larger tube running from Kobelt's tubes horizontally across the top of the second set, and ending sometimes blindly in the broad ligament, at other times in the vaginal wall. The last is known as

Gärtner's duct, and is the representative in the female of the vas deferens in the male (*v.* Figs. 17 and 112).

Pathological Anatomy.—The small pedunculated cysts developing in Kobelt's tubes are of no clinical importance. The sessile cysts which grow between the layers of the broad ligament are usually comparatively thin-walled structures, covered by peritoneum, lined with columnar epithelium—if it has not disappeared as the result of pressure atrophy, and almost always

FIG. 113.—A cyst of the broad ligament (parovarian). 1. Fallopian tube (note the folds of the broad ligament passing from it to form the capsule of the cyst). 2. Uterine end of tube. 3. Ovary. 4. Folds of broad ligament. 5. Two small accessory cysts of the fimbriæ. 6. Ovarian fimbria passing from the tube to the ovary; a bristle (7) is passed along it. (*Roberts.*)

unilocular (*v.* Fig. 113). In a few instances, they become papillomatous, and in these cases they are believed to arise in Gärtner's duct (Bland-Sutton). As, however, a papillomatous cyst of the ovary arising in the par-oöphoron sometimes tends to burrow between the layers of the broad ligament, papillomatous intra-ligamentous cysts may sometimes be ovarian, and not parovarian, in origin. Parovarian cysts, which are not papillomatous, can be distinguished from ovarian cysts in the following manner:—

(1) They are completely covered by peritoneum which can be easily stripped off.

(2) They are almost always unilocular, and very thin walled.
(3) The contents are clear and slightly alkaline, and contain a substance which is precipitated by the addition of alcohol. They are of low specific gravity —1,004 to 1,006.
(4) The Fallopian tube is stretched over the cyst in intimate connection with it.
(5) The ovary will usually be found at the back of the cyst and distinct from it.

Cysts developing in the terminal portion of Gärtner's duct burrow deeply into the pelvic cavity, and may even bulge into the vagina (*v.* page 60 and Fig. 17).

Symptoms and Treatment.—The symptoms of these cysts are practically the same as those of ovarian cysts. The treatment is also the same ; as, although small parovarian cysts are not of any great consequence, it is not possible to make a differential diagnosis between them and ovarian cysts prior to their removal. In removing them, it is seldom necessary to remove the ovary also, and they can usually be easily enucleated after incising and separating their peritoneal capsule. Gärtnerian cysts, which burrow deeply, may in some cases be most easily removed through the vagina.

Fibro-myoma.—Fibro-myomata of the broad ligament, quite distinct from fibro-myomata of the uterus, are occasionally met with. Some writers (Virchow, Kiwisch) believe that they start in the uterus and then become detacned ; but it is more generally believed that they arise, independently of the uterus, in the muscle-fibres which are prolonged into the base of the broad ligament. They manifest their presence by the pressure symptoms to which they give rise. Their removal is sometimes extremely difficult, on account of their close relationship with the large pelvic blood-vessels and the ureter.

Hæmatoma.—Hæmatoma of the broad ligament will be discussed under the head of Internal Hæmorrhage (*v.* page 264).

TUMOURS OF THE ROUND LIGAMENT.

Cysts.—Cysts of the round ligament, formed by accumulations of serous fluid beneath the peritoneal covering which accompanies

the round ligament into the inguinal canal, have been already described under the name of hydrocele of the canal of Nuck (*v.* page 46).

Fibroma.—Fibromata and fibro-myomata of the round ligament are sometimes met with. They may reach the size of a fœtal head or a little larger; they grow either into the abdominal cavity or externally, according as they are situated above or below the internal abdominal ring.

Those which grow into the abdominal cavity have to be distinguished from ovarian tumours and pedunculated uterine myomata. These tumours should be removed if they reach any considerable size, on account of the danger of their undergoing sarcomatous change. If they are growing externally, they can be easily enucleated; if growing internally, they must be removed by an abdominal cœliotomy.

CHAPTER XIII.

TRAUMATA OF THE GENITAL ORGANS.

Traumata which favour Prolapse—Symptoms—Diagnosis—Treatment. Traumata which cause Fistulæ — Varieties — Ætiology — Symptoms — Diagnosis — Treatment.

Traumata of the genital tract, occurring during parturition, are extremely common accidents. If they are classified according to the situations in which they occur, the principal forms fall under the following heads:—

(1) Traumata of the perinæum.
(2) Traumata of the recto-vaginal septum.
(3) Traumata of the vesico-vaginal septum.
(4) Traumata of the cervix.

If, however, we endeavour to group *cases* according to this classification, we shall find that many of them would fall under two or even three of these heads, and that consequently the arrangement is not very practical from the point of view of treatment. A better arrangement is to classify these traumata according to their consequences. In this way they can be divided into:—

I. Traumata which tend to produce or to favour prolapse of the vaginal walls or uterus.
II. Traumata which tend to produce fistulous communications between the genital tract and the neighbouring organs.

I. Traumata which tend to produce or to favour Prolapse of the Vaginal Walls or Uterus.—The traumata which tend to produce or to favour prolapse of the vaginal walls or uterus are lacerations of the perinæum, recto-vaginal septum, and cervix. The first two are the most important; the last only tend to favour the occurrence of uterine prolapse by setting up metritis, and so increasing the size of the uterus.

Slight lacerations of the perinæum are of little or no importance, save at the time of their occurrence. On the other hand, lacerations of either the vaginal wall or perinæum which involve the levator ani muscle are of the greatest importance, owing to the further pathological conditions which they tend to bring about.

FIG. 114.—Complete prolapse of the uterus and inversion of the vagina. Note the true ulceration of the cervix, the result of friction against the skin of the thighs. (From a photograph by Dr. Arthur Ball.)

We have already described the part played by lacerations of the levator ani muscle in producing prolapse of the uterus (*v.* page 79), and we have shown how the first step is prolapse of the anterior vaginal wall as a result of lack of support from the posterior wall. Such a prolapse is termed a cystocele (κύστις, a

bladder; κήλη, a tumour), and, as it grows, it drags upon the uterus in the region of the cervico-vaginal junction, with the result that the posterior ligaments of the uterus, and the supra-vaginal portion of the cervix are lengthened. If, in association with

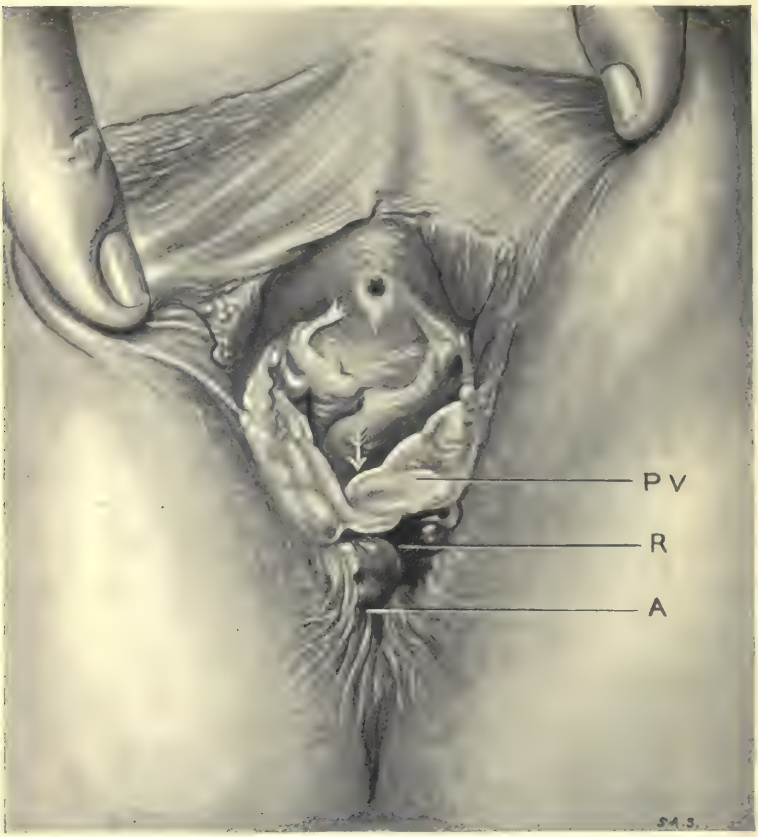


FIG. 115.—Complete laceration of the perinæum. P.V. Posterior vaginal wall. R. Rectum. A. Remains of anus. The arrow points into the vagina.

this condition of the vagina, the uterus becomes retroverted owing to the relaxation of the posterior ligaments and the downward drag of the vagina, and so comes to lie with its axis more or less coinciding with the axis of the vagina, any increase in the intra-abdominal pressure will tend to drive it downwards into the vagina (*v.* Fig. 34). As the uterus descends, it drags down the

posterior vaginal wall after it, and forms what is known as a rectocele (*rectum*, the rectum, κήλη), although there is usually no corresponding displacement of the rectal wall.

Symptoms.—The symptoms, which lacerations cause, depend

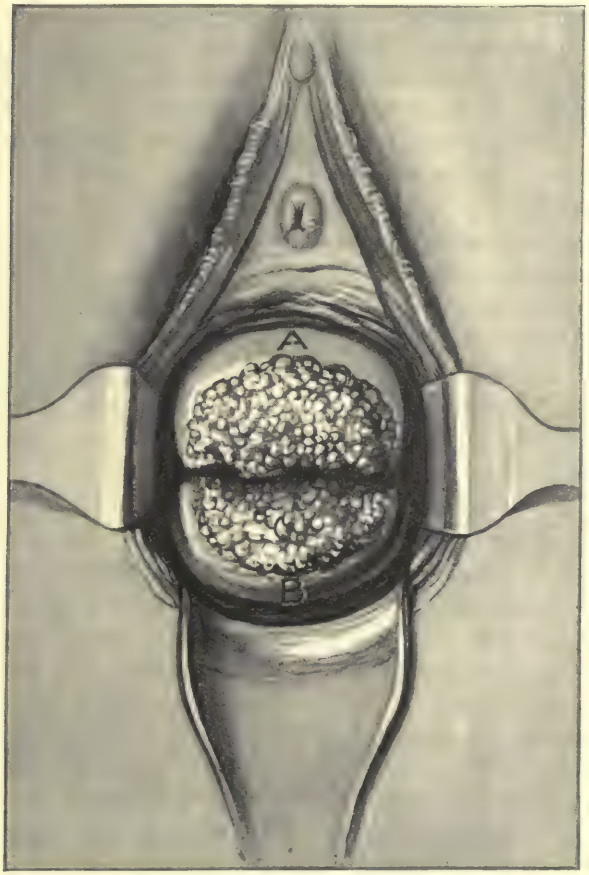


FIG. 116.—Extensive ectropion of the cervix, the result of bilateral laceration. If the points A and B on the anterior and posterior lips respectively were brought together, the ectropion would disappear.

upon their situation, their degree, and upon the amount of inflammation which accompanies them.

Perinæal lacerations, if complete, that is if through the sphincter ani and rectal wall, cause incontinence of fæces. If incomplete, they tend to cause gaping of the vagina, a condition which favours

the occurrence of vaginitis and the various symptoms by which that complaint is accompanied. If the levator ani muscle is torn and there is a prolapse of the vaginal walls, there will also be vaginitis, and probably difficulty in defæcation and micturition. If the uterus descends, there will be in addition the various symptoms of prolapse or procidentia (*v.* page 82).

Cervical lacerations cause *ectropion*, *i.e.*, eversion of the mucous membrane of the cervical canal, a condition which is liable to be confused with the so-called *erosion* (*v.* page 145 and Figs. 63 and 116). An *ectropion* may cause endocervicitis, and this in turn tends to set up endometritis with its train of symptoms (*v.* page 137).

Diagnosis.—The diagnosis of these cases can be made by inspection. A vaginal cyst may sometimes simulate a cystocele. A myoma growing from the cervix may possibly be mistaken for a prolapsed uterus. The condition of the levator ani muscle can be determined by palpating the posterior vaginal walls at each side of the middle line. If the muscle is torn, a sulcus can be distinctly felt with the fingers between the lower edge of the muscle and the perinæum, and, moreover, the absence of the free edge of the muscle from the place at which it is normally in contact with the lateral vaginal walls will be readily noticed.

Treatment.—We have already discussed the treatment of uterine prolapse (*v.* page 96), and here we shall only deal with the treatment of the different traumata with which prolapse is usually associated. Perinæal lacerations should always be sutured at the time they occur. If this was regularly and carefully done, prolapse of the uterus would be by no means so frequent as it is. Perinæal lacerations cannot always be prevented; they can, however, in almost all cases, be remedied by suturing them immediately after their occurrence, and the obstetrician who neglects to do so does not consult the interests of his patient.

For chronic complete lacerations of the perinæum, either Hegar's or Lawson Tait's operation is best. For those cases of incomplete laceration in which there is a deficiency of tissue Lawson Tait's operation is best (*v.* page 353). While for those cases in which there is a great redundancy of tissue, Hegar's colpo-perinæorrhaphy, or the modification of it which will be described, is perhaps more suitable (*v.* page 358). Whichever operation is adopted, it should be supplemented by the important

addition of bringing together with buried sutures the divided edges of the levator ani muscle (*v.* page 353). If the perinæal tear is accompanied by a cystocele, an anterior colporrhaphy should also be performed (*v.* page 367).

In lacerations of the cervix, our treatment may be palliative or radical. Palliative treatment is directed to the cure of the endocervicitis which frequently accompanies lacerations, and also to the destruction of the cervical glands whose mouths have been everted into the vagina as a result of the tear. It is carried out by curetting the endometrium and endocervix, and also by swabbing out the latter with strong caustics, as nitrate of silver, carbolic acid, or nitric acid. The application of caustics is made once or twice in the week, and the treatment must as a rule be persisted in for several months. Owing to the length of time which is usually required in order to effect a cure by these means, radical treatment is to be preferred in cases of deep laceration accompanied by much inflammation and glandular hyperplasia. It consists either in the amputation of the diseased portion of the cervix, or in suture of the tear. Amputation is usually carried out by Simon-Marckwald's or by Schroeder's method (*v.* pages 389, 380), and is the better operation in cases in which, in addition to the laceration, there is much cervical hypertrophy. Suture of the tear can be best performed by Emmet's method in the case of deep bilateral lacerations, and by Sänger's method in the case of smaller lacerations, especially when they are unilateral (*v.* pages 391, 389).

II. Traumata which tend to produce Fistulous Communications between the Genital Tract and other Organs. — Fistulæ between the genital tract and neighbouring organs have become much less common than they were formerly. This result can be almost entirely attributed to the great advances which have been made in obstetrical practice, as it is during parturition that such conditions usually start.

Ætiology.—Fistulæ may arise as the result of one or other of the following causes :—

(1) Ulceration.—Ulceration, of such a nature as to cause a fistula, is usually brought about by the prolonged presence of the fœtal head at the pelvic brim, or in the pelvis, during parturition. It may also be caused by malignant disease,

tuberculosis, abscess formation, the long-continued pressure of foreign bodies—as pessaries—in the vagina, phlegmonous vaginitis (*v.* page 54), and syphilis.

(2) Surgical interference.—A fistula may be produced accidentally in the course of a surgical operation, or it may be formed deliberately as in the treatment of cystitis (*v.* page 29).

(3) Congenital malformations. — Fistulæ due to this cause properly come under the head of "deformities." They are not, however, of very great importance; and, as their treatment—whenever possible, is the same as that of other forms of fistulæ, they may be mentioned here. They are found in three situations:—as a urethro-vaginal fistula, the result of hypospadias; as a uretero-vaginal fistula; and as a recto-vaginal fistula.

Varieties.—The following varieties of fistulæ may occur:—

(1) Urethro-	vaginal.
(2) Vesico-cervico-	
(3) Vesico-	
(4) Uretero-	
(5) Recto-	
(6) Entero-	
(7) Vesico-	uterine.
(8) Uretero-	
(9) Recto-	
(10) Entero-	

Of these various forms, much the most common is a vesico-vaginal fistula occurring as the result of sloughing after labour. This form may also occur as a result of malignant disease which has extended from the cervix to the vagina and bladder. Recto-vaginal fistulæ are perhaps the next most common, but they are much rarer than vesico-vaginal. They may be traumatic in origin, or the result of malignant disease. Urethro-vaginal fistulæ are usually the result of traumata during, or of sloughing after, labour. Occasionally, the entire urethra may have been destroyed, as in the case shown in Fig. 117. Recto-uterine fistulæ are probably always the result of malignant disease. Vesico-uterine fistulæ are said to be always vesico-cervical as the body of the uterus is not in direct contact with the bladder. This is probably true in the case of fistulæ which are the result of sloughing from long-continued pressure; but, in the case

of ulceration due to malignant disease, it is quite possible to have a fistula between the bladder and the body of the uterus. Uretero-vaginal, and uretero-uterine fistulæ may be the result of malignant disease, or of injury during such operations as hysterectomy. Entero-vaginal and entero-uterine fistulæ may be the result of abscesses in the peritoneal cavity which have burst both into an intestine and the uterus, and of malignant disease.

Symptoms.—Vesical and ureteral fistulæ give rise to incontinence of urine, the urine escaping directly into the vagina in the case of vaginal fistulæ, or through the os externum in the case of uterine fistulæ. Urethral fistulæ give rise to the escape of urine into the vagina during micturition. Rectal and intestinal fistulæ give rise to incontinence of fæces and gas.

Diagnosis.—The diagnosis of a vesical fistula is as a rule easily made. The only condition which can simulate it is incontinence of urine due to relaxation of the sphincter, but, in this condition, urine can be seen escaping from the orifice of the urethra. It is, however, sometimes extremely difficult to determine the exact situation of small fistulæ. This as a rule can best be done by injecting the bladder with some coloured solution, such as permanganate of potash or weak creolin, and then, if the opening is of sufficient size, the fluid will be seen escaping through it. Where the opening is so small that a visible quantity of the injecting fluid cannot be forced through, Pozzi recommends to apply a piece of blotting-paper to the vaginal wall after first drying the latter thoroughly. The moist absorption area on the paper will show the situation of the opening. If the fistula opens into the cervix, the latter must be dilated as far as possible, and then the opening may be found by means of a stylette. Ureteral fistulæ are more difficult to diagnose. In their case, coloured fluid injected into the bladder does not escape through the fistula; the urine which escapes comes intermittently as little gushes; if the bladder is examined with the cystoscope, the flow from one ureter is seen to be either wholly or partially stopped; if the ureters are catheterised, an obstruction to the passage of the catheter will be found at one or other side; and, lastly, if a coloured solution is injected through the catheter into the obstructed ureter, the solution will escape through the fistula.

Rectal fistulæ are usually of much larger size than are vesical fistulæ, and, consequently, are easy to recognise.

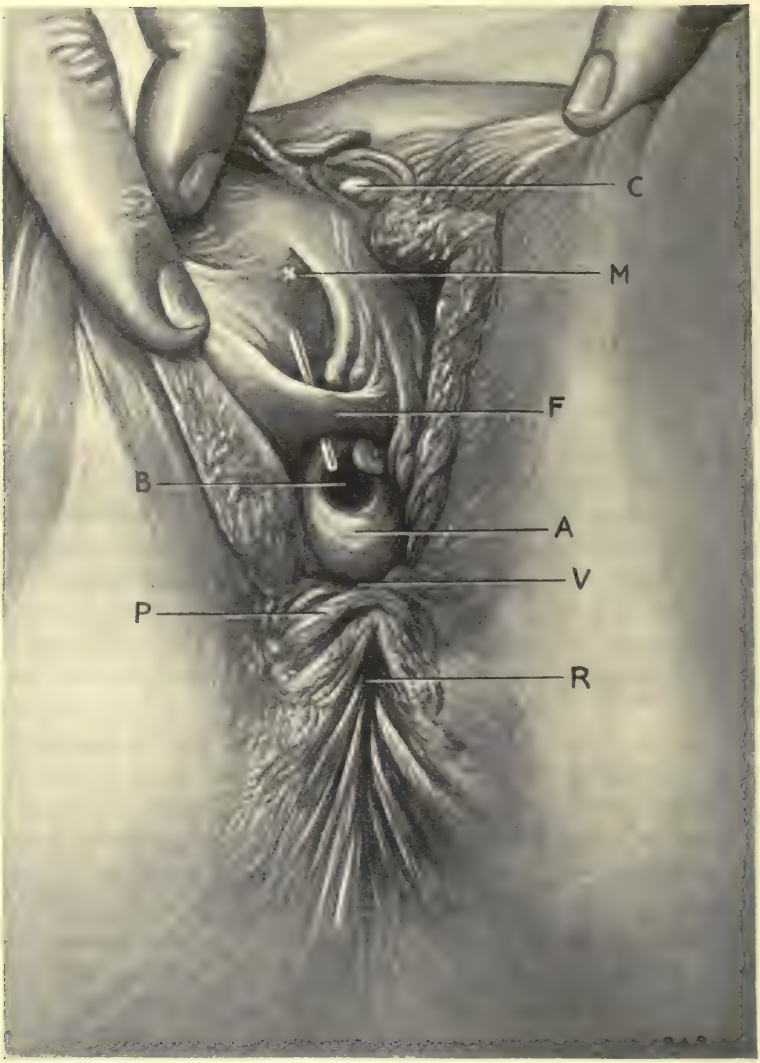


FIG. 117.—Complete destruction of the urethra associated with complete laceration of the perinæum. B. Neck of bladder where the urethra was torn across. A. Anterior vaginal wall. P. Remains of perinæum. R. Posterior rectal wall. V. Vagina. F. Mucous flap, the result of previous attempts at restoration of urethra. C. Clitoris. M. The original site of urethral orifice.

Treatment.—In all cases of fistulæ, except in those of malignant origin which are obviously hopeless, an attempt must be made to cure the condition. In recto- and vesico-vaginal fistulæ of

small or moderate size, operative treatment is usually successful, and even in the case of cervical and uterine fistulæ cures have been obtained by modern methods. The most difficult cases of all are those in which the ureter opens into the vagina, and next to these are the cases in which there is almost complete destruction of the anterior vaginal and posterior vesical walls.

Urethral fistulæ, if they are very small, may be cured by the application of caustic, or by revivification and suture of the edges; if they are large, their cure is very troublesome and sometimes necessitates the reconstruction of practically the entire urethra. This proceeding is carried out by means of flaps taken from the labia minora (Fritsch), from the recto-vaginal septum (Freund), from the vagina (Lawson Tait, Emmet), or from both the vulva and vagina (Péan). As a rule, it is recommended first to make a urethral canal and then to connect it with the bladder at a subsequent operation. In cases of very extensive ulceration, where there is no tissue from which flaps can be made, the vagina has been obliterated, in such a manner as to leave an anterior canal, which will take the place of the urethra, or to leave a recto-vaginal fistula by means of which the bladder can empty itself into the rectum.

Vesico-vaginal fistulæ are more amenable to treatment. In cases due to sloughing after labour, the best time at which to operate is from six to eight weeks after that event (Kelly). If the vaginal walls are much inflamed and covered with urinary salts or sloughs, they must be treated by frequent douches, glycerine and ichthyol plugs, and mild caustics, so as to bring them into as healthy a condition as possible. In all cases, cicatrices, which prevent the walls of the fistula being drawn together, must be divided. In cases of small or medium-sized fistulæ, the ordinary operation of vivifying the edges of the opening is sufficient (Marion Sims) (*v.* page 327). A modification of this operation has been described by Rutherford Morison, and is well suited for cases in which there is no extensive sloughing of the vaginal walls (*v.* page 329). If the vesico-vaginal septum is very thin—a condition which of course tends to make it more difficult to obtain a firm hold for the sutures—a flap-splitting operation may be resorted to, which enables a wider area of union to be obtained (*v.* page 328). In very large fistulæ, Mackenrodt's operation of separating the bladder from the vaginal wall is probably the most suitable; as,

by so doing, the bladder is freed from the rigid scar tissue which prevents the edges being brought together (*v.* page 333). In the very rare cases in which plastic operations fail, the only thing that can be done is to close the vagina—colpocleisis. This is, however, a most unsatisfactory expedient, as urine decomposes in the vagina, and sets up cystitis, from which in turn kidney infection will probably result.

In vesico-cervical or vesico-cervico-vaginal fistulæ, there is usually considerable deformity due to sloughing and to the formation of scar tissue, and this makes it very difficult to obtain a satisfactory result. If the fistula is very small, it may be cured by the application of caustic; if this fails, one of the following methods may be adopted:—

(1) Operating from the vagina, the bladder may be detached from the cervix, and the edges of the opening revivified and then sutured (*v.* page 333).

(2) Abdominal cœliotomy may be performed, the peritoneum at the bottom of the vesical pouch incised, the bladder separated from the uterus, and the fistula thus reached and sutured (*v.* page 336).

(3) An incision may be made just above the pubes in the middle line, the bladder opened anteriorly, the fistula on the posterior wall brought into view, revivified, sutured, and the wound in the anterior bladder wall and abdominal wall closed (Trendelenburg) (*v.* page 334). If the fistula cannot be closed, it may be considered advisable to obliterate the cervical orifice—hysterocleisis.

In the case of ureteral fistulæ, it is often very difficult to obtain a complete cure. The following are the various procedures which have been recommended:—

(1) Revivification and suture of the fistula. This is suited for cases of vesico-uretero-vaginal fistula, and for some cases of uretero-vaginal fistula after they have been artificially converted into the former condition.

(2) Implantation of the ureter into the bladder. This can sometimes be done when the preceding operation fails, and may be performed either by the abdominal or vaginal route. The latter, if it is possible, is preferable. Uretero-uterine fistulæ must be treated by implantation, usually performed by the abdominal route.

(3) If neither of these methods succeeds in closing the fistula, two courses remain open with a view to checking the urinary incontinence. The first of these consists in closing the vagina (colpocleisis), after making a large vesico-vaginal fistula in order to ensure the constant change of the urine which collects in the vagina. The second course consists in extirpating the kidney of the same side as the fistula. There are obvious objections to each of these courses, and accordingly they must be strictly limited to cases which resist all other treatment.

Recto-vaginal fistulæ can as a rule be easily cured by means of a flap-splitting operation or by simple revivification of the edges, except in cases which are the result of malignant disease. If the fistula is situated in the lower third of the vagina and the perinæum has also been torn, an excellent proceeding consists in splitting the perinæal body as in Lawson Tait's flap-splitting operation, carrying such splitting well above the fistula, then suturing separately the opening in the vaginal and rectal walls after first revivifying their edges, and lastly suturing the perinæum in the ordinary manner. In recto-uterine or recto-vaginal fistulæ of malignant origin, some relief may be afforded by hysterocleisis or colpocleisis.

Entero-vaginal fistulæ, if small, may be cured by the application of the cautery or of nitric acid. If this fails, revivification and suture of the edges may succeed. Cases, which resist these comparatively mild measures, may be cured in one of the following ways :—by separating the intestine from the vaginal wall, either through the vagina or by the abdomen, and directly suturing the opening in it ; by performing entero-enterostomy, or, if the fistula is low down in the small intestine, entero-rectostomy ; or, by first making a large recto-vaginal fistula and then performing colpocleisis, by this means turning the vagina into a kind of rectal diverticulum. It is unnecessary to dwell on the fact that the last course should only be adopted when all other means have failed.

CHAPTER XIV.

GENITAL ATRESIÆ.

Genital Atresiæ: Varieties—Symptoms—Diagnosis—Prognosis—Treatment.

ATRESIA (*ἀ*, negative; *τεταίνω*, I perforate) of any part of the utero-vaginal canal may occur as the result of a failure of development and so be congenital, or as an acquired condition,—as from sloughing the result of too free use of caustics, from malignant disease, or from a badly performed amputation of the cervix or trachelorrhaphy. Congenital atresiæ are the more frequent. Whether the condition is congenital or acquired, the symptoms and consequences to which it gives rise are similar.

Varieties.—The following are the principal forms which are met with:—

(1) Atresia at the level of the hymen—imperforate hymen.
(2) Atresia of the lower or middle portion of the vagina.
(3) Atresia of the cervix:—(*a*) at the os externum; (*b*) at the os internum.
(4) Atresia of any portion of one vagina in the case of a double vagina and uterus.
(5) Atresia of any portion of one cervix in the case of a double or bicornuate uterus.

Symptoms.—Atresia of any portion of the utero-vaginal canal does not, as a rule, cause sufficient symptoms to lead to its discovery until the onset of puberty. From this on, at each succeeding menstrual period, the symptoms become more marked. At first, they consist of slight pain, general discomfort, and the usual subjective symptoms of approaching menstruation, without any appearance of the flow — apparent amenorrhœa. These symptoms return every month, and after a time the patient's abdomen increases progressively in size. Each month, the pain, at what ought to have been a menstrual period, becomes worse; and finally it becomes continuous. At the same time, the lower

part of the abdomen is occupied by a tumour which rises out of the pelvis. If the atresia is situated at the hymen, this tumour will consist of the vagina enormously distended with blood—*hæmatocolpos* (Fig. 118, A), and also, in some cases, of the distended uterus—*hæmatometra* (Fig. 118, C and D), and tubes—

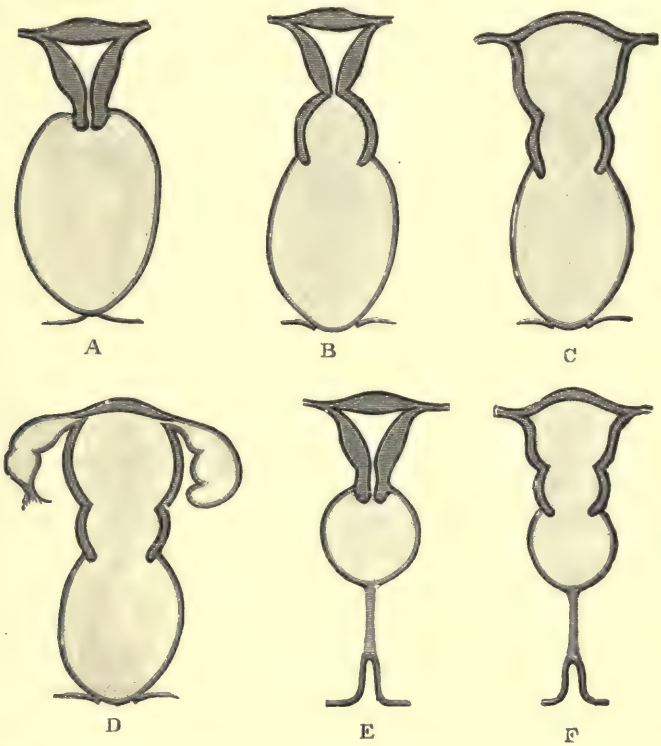


FIG. 118.—Diagram illustrating the effects of atresia of the genital passages. A. Hæmatocolpos. B. Hæmatocolpos and hæmatocervix. C. Hæmatocolpos and hæmatometra. D. Hæmatocolpos, hæmatometra, and hæmatosalpinx. The foregoing are due to atresia of the hymen. E. Partial hæmatocolpos. F. Partial hæmatocolpos and hæmatometra; both due to atresia of the lower half of the vagina. (*Sutton and Giles.*)

hæmatosalpinx (*v.* Fig. 118, D). If the atresia is situated in the vagina or at the cervix, similar distension of the cavities above the obstruction will occur (Fig. 118, E, F, and Fig. 119, G, H).

Diagnosis.—If the vulva is examined in cases of imperforate hymen, the condition can be at once recognised. The diagnosis is a little more difficult when the atresia is situated in the vagina, or at the cervix. It is especially difficult in cases of double

uterus or double uterus and vagina in which the obstruction is one-sided (Fig. 119, I, J, K, L), as some menstrual flow appears, coming from the unobstructed side. In these cases, a bimanual examination will usually enable the nature of the case to be recognised, by revealing the presence of a double uterus.

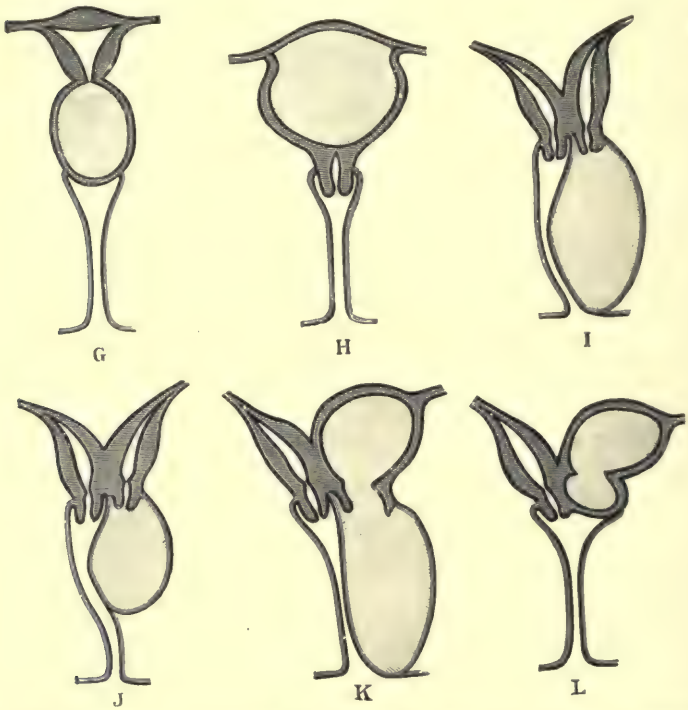


FIG. 119.—Diagram illustrating the effects of atresia of the genital passages. G. Hæmatocervix, due to atresia of os externum. H. Hæmatometra, due to atresia of os internum. I. Hæmatocolpos on one side of a double vagina, due to atresia of hymen of the same side. J. Partial hæmatocolpos on one side of a double vagina, due to atresia of lower portion of vagina of the same side. K. Hæmatocolpos and hæmatometra on one side of a double vagina and uterus, due to atresia of the hymen. L. Hæmatometra on one side of a double uterus, due to atresia of os externum. (*Sutton and Giles.*)

Prognosis.—These cases are more serious than might at first be thought. Their chief danger arises from the ease with which the retained blood becomes septic or putrid after air gains access to it. Another danger is that, in cases of great distension in which the tubes are also involved, adhesions may form between the latter and the intestines, and, as the accumulation drains

away and the uterus collapses into its normal position in the pelvis, these adhesions are pulled upon and may be torn, thus permitting the escape of the retained, and possibly toxic, blood into the peritoneal cavity.

The higher up the genital tract the accumulation of blood has extended, the greater the amount of dilatation present, and the older the retention is, the more serious is the prognosis.

Treatment.—When there is a considerable quantity of accumulated blood, care must be taken to ensure its gradual escape, and also to ensure perfect asepsis, not only during the operation itself, but during the entire time the blood is escaping. A small incision is made through the hymen just large enough to allow the fluid to escape, and the latter is allowed to drain into antiseptic cotton-wool, which is frequently changed. As soon as the greater amount of the fluid has drained away, the incision is enlarged and the cavity well douched out. If the uterus is involved, it should be plugged with iodoform gauze.

When the atresia is situated in the vagina, an operation akin to Amussat's operation for artificial vagina, is perhaps the most suitable procedure (*v.* page 369).

When the cervix is the seat of the atresia, it is sometimes difficult to make an opening into the uterus. In such cases it is usual to puncture the cervix with a trocar at the spot where the cervical canal should have been. This puncture can be then enlarged with scissors or bistoury. The contents are then washed out, and the uterus plugged with gauze.

When there is a hæmatosalpinx as well as a hæmatometra, the tubes in some cases empty themselves as soon as the uterus is emptied. In other cases, the termination is not so fortunate, and they remain dilated. In such cases it should as a rule be possible to save one or both tubes by performing abdominal section, opening the fimbriated extremity, washing out the contents, and making a new abdominal ostium (*v.* page 478).

CHAPTER XV.

INTERNAL HÆMORRHAGE OF GENITAL ORIGIN.

Intra-peritoneal Hæmorrhage — Ætiology — Symptoms — Diagnosis — Prognosis — Treatment. Extra-peritoneal Hæmorrhage — Symptoms — Diagnosis — Treatment.

Internal hæmorrhage, the result of some morbid state of the pelvic organs, may occur, as :—

I. Intra-peritoneal hæmorrhage.
II. Extra-peritoneal hæmorrhage.

I. Intra-peritoneal Hæmorrhage.—Intra-peritoneal hæmorrhage is the term applied to hæmorrhage into the peritoneal cavity. When such hæmorrhage occurs, the blood is either diffused freely about the peritoneal cavity, or is encysted owing to the formation of limiting adhesions. The former condition is known as diffuse intra-peritoneal hæmorrhage; the latter, as a hæmatocele (αἷμα, blood; κήλη, a tumour).

Ætiology.—Intra-peritoneal hæmorrhage of genital origin can arise in the following ways :—

(1) Rupture of the sac of an extra-uterine pregnancy, or the occurrence of tubal abortion.
(2) Rupture of the uterus during pregnancy or parturition.
(3) Perforation of the uterus during an intra-uterine operation, as curetting.
(4) Slipping of a ligature from a vessel after any intra-peritoneal operation.
(5) Ulceration of an intra-peritoneal malignant growth, resulting in the opening of a vessel.
(6) Rupture of an ovarian cyst from trauma or over-distension.

The only form of hæmorrhage with which we are here concerned is that due to the rupture of an extra-uterine pregnancy, or to the occurrence of a tubal abortion, that is the expulsion of an

ovum from the tube through the abdominal ostium into the peritoneal cavity.

It is of importance to recognise why in one case diffuse hæmorrhage occurs, and in another the hæmorrhage is encysted, as in the former case the amount of blood lost, and hence the danger to the patient's life, is very much greater than in the latter case. All blood poured out into the peritoneal cavity tends to encyst itself, both owing to the clotting of the blood which has been poured out first, and to the irritation of the peritoneum by the effused blood, — an irritation which causes a transudation of lymph and a consequent formation of adhesions. Clotting, sufficient to cause a limitation of the blood, is favoured by the gradual occurrence of the hæmorrhage. On the other hand, if the bleeding is very free, there is not time for a sufficiently firm barrier to be formed by the occurrence of clotting to prevent the further escape of blood. Accordingly, there will be a greater tendency to diffuse hæmorrhage when a tubal gestation sac is suddenly ruptured, than when a slow process of tubal abortion occurs.

Again, the limitation of the blood by means of adhesions is most likely to occur when the peritoneum is in an unhealthy and easily irritated condition, and when adhesions have already formed. That is to say, *ceteris paribus*, diffuse hæmorrhage is more likely to occur when the peritoneal cavity is healthy, encysted hæmorrhage when pelvic peritonitis is present. The effect, which the nature of the case, *i.e.*, rupture or abortion, and the condition of the peritoneum, have upon the amount of hæmorrhage, is well expressed in the following sentence :—" The chances of a maximum amount of hæmorrhage are realised in cases of rupture occurring into a healthy peritoneum; of a minimum amount, in cases of abortion when the peritoneal cavity is divided into loculi by adhesions " (Labadie-Lagrave).

Symptoms.—The symptoms of internal hæmorrhage depend upon the amount of blood lost, and on the rapidity with which it is lost. In serious cases, these are the ordinary symptoms of hæmorrhage :—collapse, rapid pulse, falling temperature, cardiac failure, cold sweats, rapid and sighing respirations, extreme pallor, and coldness of the extremities. To these symptoms are added others due to the presence of blood in the peritoneal cavity :—extreme pain of so severe a character that it

is often difficult to tell whether the collapse of the patient may not be due to it alone,—if the hæmorrhage is occurring very gradually this pain is not so well marked; tenderness and distension of the abdomen; and vomiting.

The foregoing are the immediate symptoms at the time of rupture; if the patient survives and the blood becomes encysted, other symptoms appear after a short time. Encysted hæmorrhage is always found in Douglas' pouch, owing to the situation of the rupture and to the fact that the pouch is the most dependent part of the peritoneal cavity. Consequently, if the hæmatocele is of large size, the symptoms will be those of intra-pelvic pressure, such as occur in the case of an impacted ovarian cyst:—pain from pressure on the pelvic nerves; constipation, owing to the coagulation of the ring of blood which surrounds the rectum; and interference with the passage, or perhaps complete retention, of urine, owing to the displacement forwards of the uterus so as to press upon the base of the bladder.

Finally, during, and as a result of the process of absorption of the hæmatocele—a process which takes from one to ten months according to the amount of blood originally lost, the patient suffers from a certain amount of auto-intoxication, as shown by her somewhat jaundiced aspect, her great debility, and the tendency she has to slight fluctuations of temperature. In some cases, the process of absorption does not go on aseptically. Bacteria make their way from the rectum into the hæmatocele, and putrefaction or suppuration of the clotted blood takes place. An abscess thus formed may burst into the rectum or vagina, or, more rarely, into the bladder or intestine, or through the abdominal wall.

Diagnosis.—The diagnosis of diffuse hæmorrhage must be made from the symptoms, as there are no characteristic physical signs. The collapse of hæmorrhage is most likely to be confused with the collapse caused by violent abdominal pain. A small dose of morphia (one-sixth to one-third grain) administered hypodermically will relieve the symptoms if they are merely due to pain; if they are due to a continuing hæmorrhage, it will not do so.

A retro-uterine hæmatocele is felt from the vagina as a rounded tumour which fills Douglas' pouch exactly, depressing and almost obliterating the posterior vaginal fornix, and displacing the uterus forward. At first, the tumour has a soft,

semi-fluctuating, and boggy feel; later on, as the blood coagulates, it becomes of an almost woody hardness. Perhaps the most characteristic point about a hæmatocele is the manner in which the coagulated blood almost entirely surrounds that portion of the rectum which has a mesentery. This condition is also met with in the case of an old pyosalpinx, in association with which there is a considerable amount of cellulitis and peritonitis, but in such a case it is not so marked.

A retro-uterine hæmatocele has also to be distinguished from a retroverted gravid uterus and an incarcerated ovarian cyst or

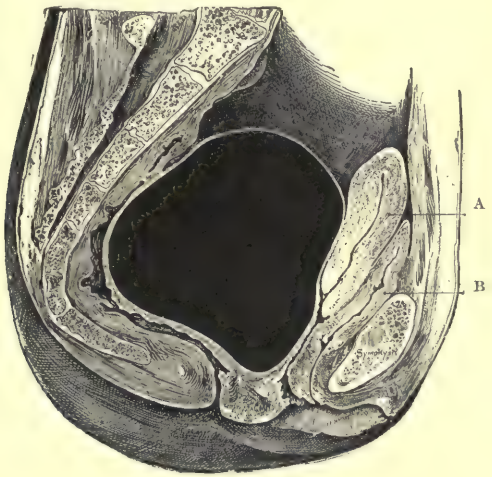


FIG. 120.—Sagittal section of a pelvis showing the effects of a retro-uterine hæmatocele. (*Skene.*) A. Uterus. B. Bladder. (The relations of the bony parts in the diagram must not be regarded as typical.)

myoma. A retroverted gravid uterus is distinguished by the history of the gradual onset of the symptoms, and by the fact that the uterus cannot be palpated as separate from the tumour which fills Douglas' pouch; while in a hæmatocele, the uterus is anteposed to the tumour, and consequently the fundus can be felt anteriorly (*v.* Fig. 120). If a diagnosis cannot be made by a bimanual examination, and the patient's symptoms are urgent, it is better to pass a sound in order to determine the exact relationship of the uterus to the tumour in Douglas' pouch, as the mistake of passing a sound into a retroverted pregnant uterus is not fraught with such dangerous consequences for the patient,

as would be that of endeavouring to lift a possibly septic hæmatocele out of the pelvis.

An incarcerated ovarian cyst or myoma can usually be easily diagnosed by the history and symptoms, and by the fact that neither of these growths tends to surround the rectum in the manner which is so characteristic of a hæmatocele, or of old cellulitic inflammation, but rather to flatten it against the sacrum.

Prognosis.—The prognosis depends upon whether the hæmorrhage is encysted or diffuse. The prognosis of diffuse hæmorrhage, which is allowed to continue, is extremely bad. In a small proportion of cases, if only a very small vessel is involved, the bleeding may gradually stop owing to the formation of a clot round the vessel's mouth. Sometimes this cessation is only temporary, some slight movement of the patient dislodges the clot, and the hæmorrhage commences again. The prognosis after operation and ligation of the bleeding vessels is wonderfully good, when the condition of the patient previous to the operation is taken into account.

The prognosis in the case of a hæmatocele, which is not removed, varies according to the size of the hæmatocele. All small and a few large hæmatoceles are absorbed aseptically. On the other hand, many large hæmatoceles suppurate, and give rise to a pelvic abscess. In such cases, the prognosis is worse than if operation had been performed before suppuration occurred.

Treatment.—The treatment of diffuse hæmorrhage is to open the abdomen with as little delay as possible, and to remove the ruptured tube as well as the clots with which the peritoneal cavity is filled.

All hæmatoceles which completely fill Douglas' pouch and are large enough to cause pressure on the pelvic organs should be removed, whether they are suppurating or not, as the likelihood of suppuration occurring is very considerable. If the hæmatocele is aseptic, it is probably best removed by an abdominal cœliotomy, and at the same time the injured tube can, if necessary, be removed. If it is suppurating, it is certainly better removed by the vagina, as by so doing it is possible to avoid opening into the general peritoneal cavity (*v.* page 506). A small hæmatocele may be left alone, if we have reason to believe that the ovum is so small that it can be absorbed. If, on the other hand, the ovum

is more than two months old, it is improbable that it will be completely absorbed, and an operation is usually advisable. One of the consequences of not operating in these cases is shown in Fig. 121, which shows a case in which double pyosalpinx formed subsequently to the rupture of a tubal pregnancy at about the third month. In this case, no operation was performed at the

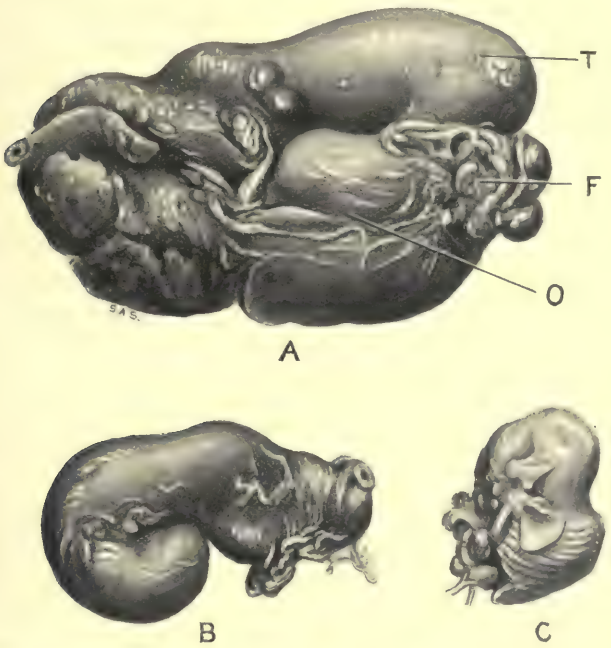


FIG. 121.—Double pyosalpinx associated with the presence of the skeleton of an extra-uterine fœtus. A. Appendages of left side. T. Distended tube. O. Ovary. F. Point to which fœtal skeleton was attached. B. Right Fallopian tube. C. Skeleton of fœtus which was attached at F.

time of rupture, but two years later the patient came under our care and we operated on account of tubal infection and found the skeleton of a two and a half to three months fœtus. If we decide not to operate, absorption of the effused blood can be facilitated by keeping the patient at rest in bed, and administering hot vaginal douches. If suppuration should occur, the abscess must be opened from the vagina.

II. EXTRA-PERITONEAL HÆMORRHAGE.—The only form of extra-peritoneal hæmorrhage with which we are concerned is that

which takes place into the layers of the broad ligament. This condition is known as hæmatoma of the broad ligament.

Ætiology.—Extra-peritoneal hæmorrhage is probably always caused by the rupture of a tubal gestation sac. If the tube ruptures in its upper three-fifths—that is, in that portion which is covered by peritoneum, the effused blood escapes into the peritoneal cavity. If it ruptures in its lower two-fifths—that is, in that portion which is not covered by peritoneum, the blood escapes between the layers of the broad ligament. On account of the limiting effect of the peritoneal investment, the hæmorrhage in these cases is as a rule not very serious.

Symptoms.—The symptoms are those of intra-peritoneal hæmorrhage but are slighter in degree, as the amount of blood lost is usually much less.

Diagnosis.—In the absence of a definite history, the diagnosis of hæmatoma of the broad ligament is often very difficult. The intra-ligamentous situation of the tumour can generally be determined by noting the intimate manner in which it is related to the pelvic wall. Moreover, an intra-ligamentous parametric exudation usually extends somewhat under the pelvic parietal peritoneum, a hæmatoma rarely does. An intra-ligamentous cyst is as a rule not attached to the pelvic wall, and does not tend to get smaller as a hæmatoma does, but rather to increase in size. In some cases where the rupture has occurred into the left broad ligament, blood may burrow outwards beneath the peritoneum which covers the rectum, and surround the last in such a manner as to simulate a hæmatocele. In such a case, the constricting ring round the rectum invests the second or subperitoneal stage, and not the first stage as happens in the case of a hæmatocele.

Treatment.—In the great majority of cases, the only treatment required is to keep the patient at rest, in order to favour the absorption of the effused blood. Suppuration is a very rare complication, as the blood is not usually in contact with an intestine. If such a complication does occur, the abscess should be opened, if possible, from the vagina.

CHAPTER XVI.

GYNÆCOLOGICAL OPERATIONS.

Definitions — Sterile — Aseptic — Antiseptic — Surgical Cleanliness — Sterilisation. Preparation of the Operating Room — Dressings — Gloves — Sponges Instruments — Catheters — Suture Materials — Preparation of Patient — Preparation of the Operator and his Assistants — Antiseptics — Operating Table and Gynæcological Couch.

Before attempting to perform any operation, except in cases of great emergency, it is necessary to ensure that the patient is placed under the most favourable circumstances possible to resist the danger of the operation. Of these dangers, that which is at once the most formidable and the most readily overcome, if sufficient care is used, is undoubtedly sepsis. In this connection, it is necessary to commence by defining a few terms of everyday use.

By the term *sterile* is meant the entire absence of living micro-organisms. By the term *aseptic* is meant the entire absence of septic organisms. By the term *antiseptic* is meant any substance which is capable of destroying septic organisms. These are all definite terms, but the next term is by no means so definite, *i.e.*, *surgical cleanliness*. The meaning which we should like this term to convey, and the meaning which we are compelled by circumstances to attach to it, are widely different. The object of all research into the different modes of sterilisation is to make surgical cleanliness correspond as closely as possible with sterility. This, unfortunately, is as yet impossible in the majority of cases. Sterility is always impossible on account of the number of saprophytic organisms which are in the air. The highest degree of surgical cleanliness is attained in the case of those substances which can be exposed to the prolonged action of heat, *e.g.*, dressings and instruments, and even here the term is at best usually synonymous with asepsis, while in the case of the operator's hands, or the skin of the patient, we can never attain to such a degree. In their case, the most that can be expected is that the external layers of the skin are rendered aseptic, while

the deeper layers are still swarming with micro-organisms. Fortunately, as practice proves, this is sufficient. The term *surgical cleanliness* must then be taken to mean the nearest approach to sterility that can be obtained by the careful carrying out of those methods which experience proves to be most reliable. The last term, *sterilisation*, is that usually applied to the process by which hands, instruments, etc., are rendered surgically clean. It is obviously not a perfectly correct term, but, inasmuch as it embraces the end at which we are aiming, and so always keeps it before us, it is a suitable one.

Operating Room.—The three main essentials which should be looked for in selecting a room for an operation are—light, warmth, and the capacity of being rendered surgically clean. Of the first, it is necessary to say little. There must be sufficient light, and, if possible, it should be a north light in order to avoid deep shadows. The temperature of the room should be about 70° F., as a prolonged operation is more easily borne by the patient when carried out in a warm atmosphere. An operating theatre in a hospital should be built in such a manner that it can be readily washed out with a hose from top to bottom. All sharp angles or projecting edges should be avoided, on account of the difficulty of keeping them clean. The furniture should be as far as possible of metal, glass, or other impervious substance. There should be a properly regulated system of ventilation, so as to ensure purity of atmosphere without at the same time causing draughts. When operating in a private house, the room must be made as far as possible to satisfy these conditions. All hangings, carpets, and unnecessary furniture must be removed. The walls must be swept down and the floor thoroughly scrubbed. An hour or so before the operation the room should be dusted again with a *wet* duster, and any carpets or furniture which cannot be removed should be covered with damp sheets.

Dressings.—All dressings, which are not impregnated with a volatile antiseptic, must be sterilised before the operation, and kept in the case in which they were sterilised until the moment comes for applying them. The same remark applies to the towels, sheets, etc., which are used during the operation, and to the operator's coat and gloves. A steam steriliser is best suited for this purpose, and the steam should be slightly superheated in order that it may penetrate into the centre of the contents, and

also that, by its more rapid evaporation when the steriliser is opened, the contents may be fairly dry when removed. For small quantities of dressings, the most easily worked steam steriliser is that known as Schimmelbusch's (*v.* Fig. 122).

Gloves.—Rubber gloves can be best sterilised by placing them in a gauze bag and immersing them in boiling water for five minutes. They are then taken out and dropped into a basin of sterilised water. After use they must be thoroughly washed inside and outside, and boiled for five minutes. They must then be dried and powdered with any fine powder, such as French chalk or boracic acid, in order to prevent them from sticking together.

Sponges.—The sponges, which are used during an operation, must be composed of some substance which is a good absorbent

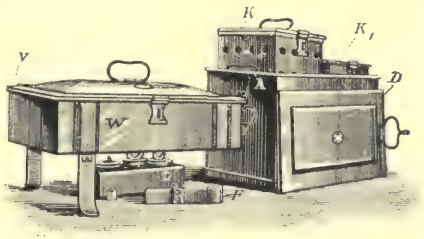


FIG. 122.—Schimmelbusch's steriliser for instruments and dressings. *W*. Tray for instruments. *K* and K_1. Caddies for dressings. *A*. Case to hold *K*. To use *A*, the lid, *V*, of *W* is removed and placed on *A*, which then fits on to the top of *W*. *L*. Lamp. *F*. Detachable foot of *W*.

and easily sterilised, and which is of so moderate a cost that there is no hesitation in destroying them when once used. The material known as "butter muslin" answers these requirements. It is made up into flat pads, from six to ten inches square, and containing from four to six thicknesses of the muslin. These are then sterilised in a steam steriliser. The usual time allowed for sterilisation is thirty minutes, counted from the time the steam commenced to blow off at the valve.

Instruments.—The sterilisation of instruments is most easily effected by boiling them from ten to fifteen minutes in water containing a little common washing soda to prevent rust. In order to enable the instruments to withstand boiling, they must be of metal. During the operation it is most convenient to use them dry, and with this object they are placed after removal from the

steriliser in perforated trays. Dry instruments are much more easily handled than are wet ones when the operator is wearing

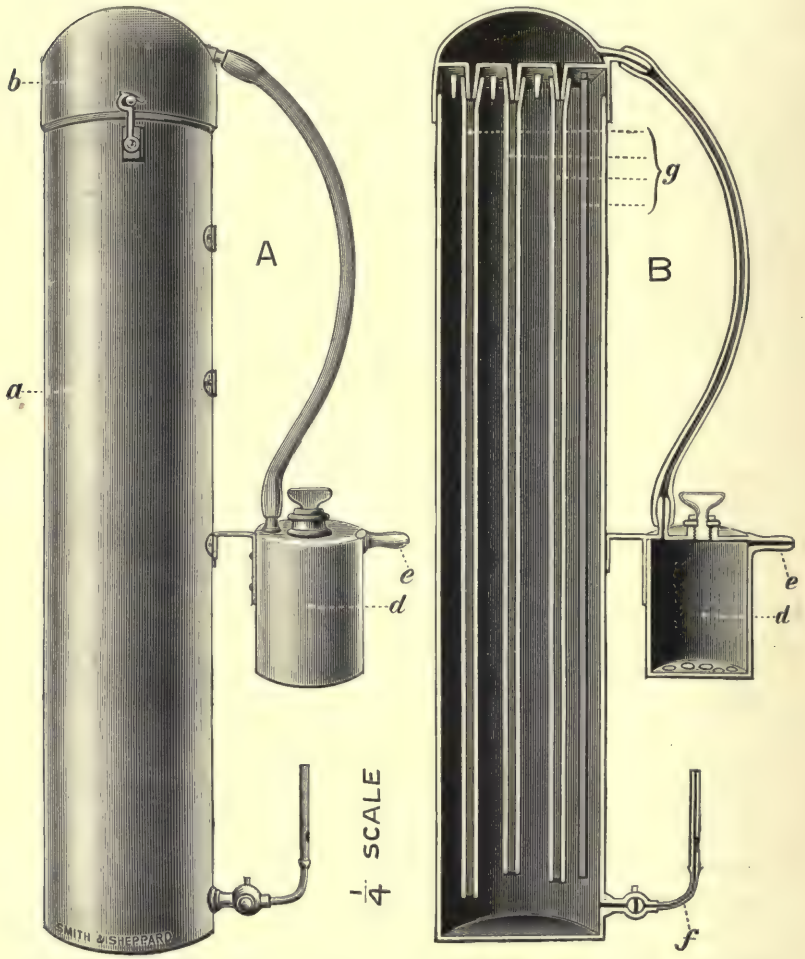


FIG. 123.—Catheter steriliser for use with formalin gas—German model. A. General view. *a*. Container for catheters. *b*. Cover. *e*. Gas inlet. *d*. Chamber for formalin tablets. B. Sectional view. *g*. Catheters in position. *f*. Gas burner.

rubber gloves. If, however, he prefers his instruments wet, they may be placed in sterilised water, or in an antiseptic solution, such as lysol or carbolic lotion, if sterilised water cannot be obtained.

Ureteral catheters and cystoscopes containing glass lenses, etc., cannot be sterilised by heat, and consequently must be exposed to the prolonged action of an antiseptic. This can be most easily and safely done by submitting them to the action of formalin gas. A satisfactory apparatus for this purpose is shown in Fig. 123. As will be seen, it consists of a long metal cylinder, to the side of which is fixed a smaller metal cylinder. From the inside of the cover of the larger cylinder a number of nipples project, on to which can be fitted the catheters, etc. These communicate by a rubber tube with the smaller cylinder *d*, which in turn carries a nozzle *e*, over which can be fitted a tube coming from an adjacent gas burner. An opening leads from the bottom of the larger cylinder to a Bunsen burner *f*. The apparatus is used as follows:—The catheters are placed on their respective nipples, and the tops of the large cylinder securely fastened on. Formalin tablets are placed in the smaller cylinder. The nozzle *e* is connected with the gas burner and the gas turned on. The gas blows through *d* and along the rubber tube into the cover of the large cylinder, thence down the nipples, and through the catheters hanging from them, into the large cylinder itself, and finally out through the Bunsen burner, where after a few moments it can be lighted. The heat of this burner generates formalin vapour from the tablets in *d*, and this vapour is carried with the coal gas through and round the catheters to the Bunsen burner, where it is destroyed in the flame. The circulation of the coal gas ensures the circulation of the formalin vapour, and the catheters are subjected inside and outside to the action of the latter. The flame at *f* should be a small one, and care must be taken that the large cylinder does not get over-heated. The sterilisation should be continued for half an hour.

The sterilisation of tents for dilatation of the cervical canal is usually carried out by immersing them for a week or so in a one per cent. solution of corrosive sublimate in alcohol. They can also be sterilised in the author's catgut steriliser in superheated alcohol, as will be described (*v.* page 277).

Sutures. — The materials commonly used for sutures are — silk, silkworm gut, and catgut. Silk is most suitable for use when a strong ligature is required, or when the ligature is required to last for a considerable time. It can be buried in the

tissues with safety, if it is aseptic, and if the place where it is buried is free from any risk of future infection. It is as a rule wise to avoid its use in skin wounds, on account of its capillarity. It is usually sterilised by boiling for thirty minutes in water, and it is then stored in 1 in 500 corrosive sublimate. Another way of preparing it, and one which is said to render it antiseptic instead of aseptic, and so less likely to be invaded by bacteria when buried, is as follows :—Steep the silk for twenty-four hours in ether, and then for another twenty-four hours in absolute alcohol. Then boil in 1 in 500 corrosive sublimate solution for ten minutes, and store in a similar solution. As a rule, silk of three different strengths is required—fine, medium, and strong. We are in the habit of using Nos. 2, 4, and 6.

Silkworm gut is a most valuable suture material, especially for use in places from which it can be subsequently removed, and it is more suitable than silk for skin wounds, on account of its freedom from capillarity. It can also be buried in the tissues under the same conditions as silk. It is sterilised by boiling for twenty minutes in water, and then is stored in 1 in 500 corrosive sublimate lotion.

Catgut is also a most valuable suture material, for use in places from which the suture cannot subsequently be removed. The two chief objections to its use are the difficulty of sterilisation and the possibility that it may be absorbed before the tissues which it unites have completely healed. The only efficient mode of sterilisation consists in subjecting the gut to a sufficient degree of heat, as the older methods of attempted sterilisation by means of chemical antiseptics are unreliable. There is considerable difficulty in applying heat to catgut, without completely destroying it, but of late three satisfactory methods of doing so have been described. The first, the cumol method, is extremely troublesome, and necessitates the attention of a skilled assistant. This method, as devised by Krönig, and modified by Clarke and Miller, consists of the following steps :—

(1) Wind the catgut in suitable lengths in a figure of eight form.

(2) Raise it gradually to a temperature of 80° C. (176° F.) in a hot-air oven or sand-bath, and keep it at this heat for one hour.

(3) Place the gut in cumol at a temperature of 100° C. (212° F.), raise the temperature to 165° C. (329° F.), and keep it there for one hour.

(4) Pour off the cumol, and dry the gut in a sand-bath or hot oven at 100° C. for two hours.

The second method consists in immersing the gut in superheated absolute alcohol for the necessary time for complete sterilisation. It was first devised by Fowler, and, as slightly modified by the author by the introduction of a suitable apparatus in which to superheat the alcohol, provides an easy and comparatively inexpensive method of sterilisation. The steps are as follows:—

(1) Roll the gut very loosely on round glass or metal reels.

(2) Immerse the reels in absolute alcohol, in order to dehydrate the gut. They must lie in this for at least three days.

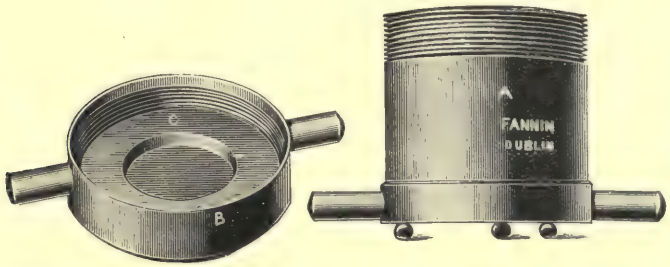


FIG. 124.—Author's catgut steriliser. A. Steriliser. B. Screw top. C. Rubber washer.

(3) Place the reels in the brass box made for the purpose (*v.* Fig. 124), and cover with absolute alcohol. The box is immersed completely in a saucepan of cold water, which is then raised to boiling point and kept there for thirty minutes.

(4) Remove the reels from the steriliser, and store them in a mixture of sterilised glycerine ten parts and methylated spirit ninety parts, to which, if desired, five per cent. of formalin may be added.

Premature absorption of catgut can be prevented by chromicising it prior to dehydration.

The third method—the formalin method—is the simplest of all. It was introduced by Senn, and is very satisfactory. As modified by C. A. Ball it is as follows:—

(1) Roll the gut firmly and evenly on glass or wooden reels of about an inch in diameter, tie the ends, and immerse the reels in a five per cent. solution of formalin for twenty-four hours.

(2) Place the reels under a stream of running water for some minutes, to wash away the formalin.

(3) Store the reels in methylated spirit or absolute alcohol, until such time as required.

(4) Drop the reels into boiling water and boil for from five to ten minutes according to the thickness of the gut.

(5) After boiling store them in the following mixture:—Corrosive sublimate, 1 part; glycerine, 250 parts; methylated spirit, 1,000 parts. If the gut is required for immediate use, place the reels in absolute alcohol for a few minutes, in order to dehydrate the gut a little, and so by reducing its size make it more easy to thread the needles. As a rule catgut of three different strengths is required. We are in the habit of using Nos. 1, 3, and 5.

Preparation of the Patient.—As a preliminary to minor operations on the vagina, the external genitals are shaved and thoroughly scrubbed with soap and water the day previous to the operation; a large compress soaked in 1 in 500 corrosive sublimate is placed over the vulva and surrounding skin and kept in place with a T bandage. This compress is again soaked in the antiseptic whenever the patient passes water, and is replaced. Immediately before the operation, the skin of the thighs, perinæum, and anterior abdominal wall is again thoroughly washed, and the vagina is douched with creolin or lysol lotion and well washed with soap and water. Sterilised stockings reaching to the thighs are then placed on the patient's legs, a sterilised sheet is thrown over the abdomen, and a sterilised towel is placed under the patient so as to cover the pad (*v.* Fig. 204). If the peritoneal cavity is to be opened *per vaginam*, it is well to douch the vagina and plug it with iodoform gauze the day before the operation; on the morning of the operation, the plugging is removed and the vagina again thoroughly washed and douched. In the case of ventral cœliotomies, the patient is given a warm bath on the afternoon before the operation, the skin of the abdomen washed with soap and water and finally with ether, and a compress, soaked in a one per cent. solution of corrosive sublimate in glycerine, applied over the proposed site of incision. This compress remains *in situ* until the patient is on the operating table, when it is removed and the skin again washed with soap and water, then with ether, and finally with an alcoholic solution of bin-iodide of mercury 1 in 500.

A large sheet is then thrown over the patient so as to cover her completely below the symphysis. A similar sheet covers the upper part of her body and extends down as far as the umbilicus.

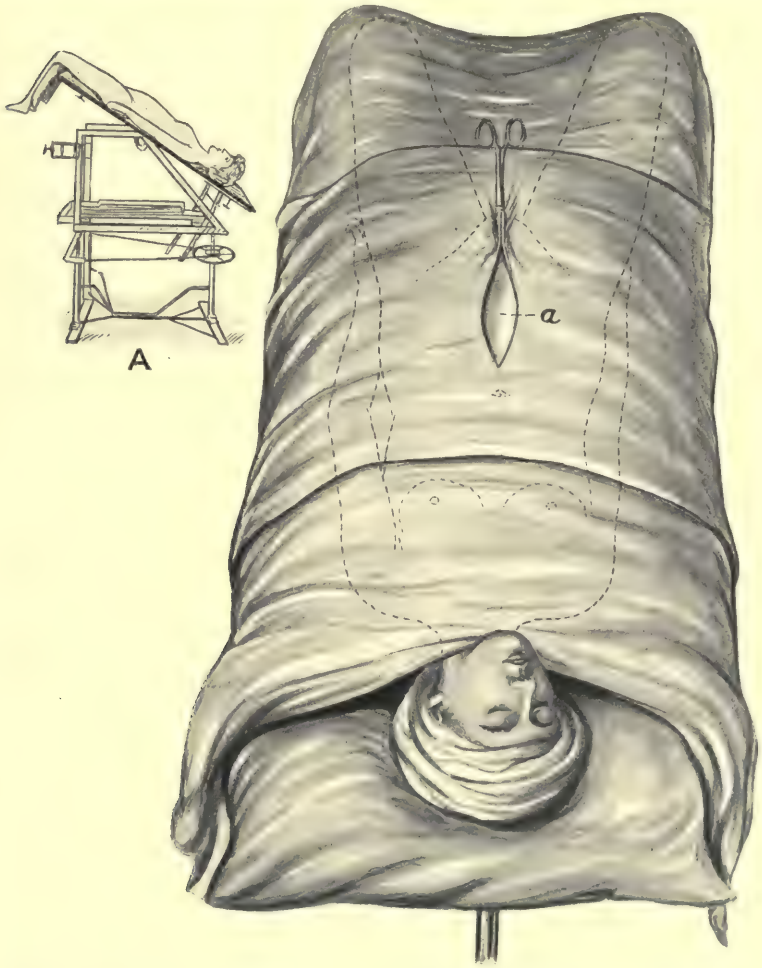


FIG. 125.—The patient prepared for an abdominal cœliotomy. *a*. Opening in small sheet corresponding to site of incision. A. Side view of the patient in the Trendelenburg position.

A third and smaller sheet with an opening corresponding to the proposed site of incision is thrown over the space between the two sheets, in such a manner as to cover completely the interval left between them (*v*. Fig. 125).

Preparation of the Operator and Assistants.—The efficient sterilisation of the hands and forearms of the operator and his assistants is a matter of some difficulty, and for this reason india-rubber gloves should always be worn by every one directly concerned in the operation. Their use however does not remove the necessity for careful preliminary disinfection with the double object of preventing the infection of the gloves whilst they are being put on, and of lessening the risk from small punctures or tears of the gloves during an operation. Disinfection is carried out as follows:—After the finger-nails have been cut short, the hands and forearms must be scrubbed for at least fifteen minutes with hot water and soap, using frequent changes of water, and paying particular attention to the skin round the nails. When the soap has been washed off with plain water, they are immersed in corrosive sublimate or bin-iodide solution 1 in 500 for a minute or longer, and at the same time are scrubbed with a nail brush. An alternative antiseptic course consists in plunging them, after scrubbing, first into a saturated solution of permanganate of potash until they are of a dark mahogany colour, and then into a saturated solution of oxalic acid until they are decolourised. The oxalic acid is finally washed off with sterilised water or, preferably, with sterilised limewater.

As soon as the hands have been rendered as aseptic as possible, the operator is dressed in a sterile linen coat which is held by a nurse in such a manner that he will not touch its outer surface with any part of his body or clothes while he is putting it on. This coat should fasten at the back, and have sleeves which either are long enough to cover the wrists completely, or which stop short above the elbows. In the latter case, sterilised gauntlets of linen must be worn reaching from above the elbow to the wrist where they button. The wrists of the gloves overlap the wrists of the coat or the gauntlets, and so complete the covering of the forearm. The next step consists in putting on the rubber gloves, and, as in the case of the coat, this must be so done as to avoid touching the outside of the gloves with the naked skin.

The final step consists in putting on a mouth and hair guard with the object of preventing infection being carried by the breath, or falling from the hair. The form of guard usually adopted consists of a kind of linen mantilla, closed just below or above the nose so as to leave the eyes exposed.

There is no doubt that the introduction of rubber gloves constituted one of the great advances in the technique of aseptic surgery. Not alone do gloves enable an actual and theoretical degree of sterility to be obtained, which prior to their introduction was impossible, but also they protect the operator from accidental infection by pus, etc., during a septic operation or examination. Further, the excessive preparation and disinfection of the hands with hard nail-brushes and the prolonged use of antiseptics are in a great measure rendered unnecessary, with the result that the operator is able to maintain his skin in good condition. This last is a most important point, as it is much easier to disinfect soft and elastic skin than skin which has been abraded and roughened by mechanical and chemical means. As an additional aid to maintaining the hands in good condition in cold weather, or to removing any roughness, the operator ought to apply to them after operating a little glycerine or other softening agent. We have found the following preparation of considerable value for this purpose :—

℞ Pulv. Acidi Boricis, ʒiss
Tr. Benzoin. Co., ʒii
Lin. Camphoræ Co., ʒiv
Liq. Cocci Cacti, ʒi
Glycerinæ ad, ʒx

Shake well. Allow to stand for six hours. Strain through gauze.

Antiseptics.—The number of antiseptics which have been introduced during the last few years is very great. The following are those in general use for the disinfection of the hands, for douches, etc. :—

(1) *Corrosive Sublimate.*—This is a reliable antiseptic, if used of a sufficient strength. It is especially suited for the disinfection of the skin. Its use must be avoided in places where there is any risk of absorption taking place, or where it will come in contact with blood or other albuminous discharge by which it is decomposed. The usual strength for skin sterilisation is 1 in 500.

(2) *Bin-iodide of Mercury.*—This is a valuable and reliable antiseptic. It differs from corrosive sublimate in that instead of constringing the skin it renders the latter soft and slippery, and in that it is not so easily decomposed. It is used for skin sterilisation at a strength of 1 in 500 to 1 in 1,000.

(3) *Cyllin.*—Cyllin, or creolin, as it was formerly called, is an antiseptic which is particularly free from danger so far as poisonous properties are concerned. It is at the same time a tolerably reliable antiseptic. It is principally of use for douching purposes, and is used at a strength of 1 in 320, *i.e.*, half an ounce to the gallon.

(4) *Lysol.*—Lysol is stated to be almost as powerful an antiseptic as corrosive sublimate. It contains a large proportion of

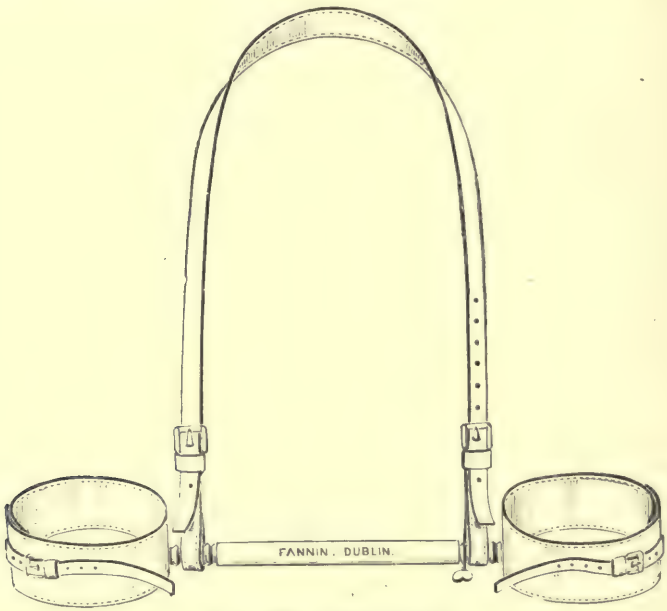


FIG. 126.—Clover's crutch.

soap, and so in a one per cent. solution is well suited for the cleansing and disinfection of the hands. For the same reason, it is of considerable use as a lubricant in cases where one is required.

(5) *Formalin.*—Formalin—the name applied to a forty per cent. solution of formic aldehyde—is one of the strongest antiseptics known, and is at the same time comparatively harmless to human life. The principal objections to it are, that it is rather volatile and so easily loses its strength when exposed to the air, that its fumes are extremely unpleasant, and that it is intensely irritating to the hands. It is principally used as a gaseous

FIG. 127.—Mackenrodt's operation table

FIG. 128.—Mackenrodt's operation table, arranged for the Trendelenburg position.

disinfectant for room sterilisation, for which purpose it is of considerable value. It cannot be used for skin sterilisation on account of its irritating effect, but it can be used to disinfect the interior of the uterus or the ulcerating surfaces of malignant growths.

Operating Table and Gynæcological Couch.—An operating table should be as uncomplicated as possible, so that there may be a minimum of trouble in keeping it clean. At the same time, in order to be suitable for all cases, it must be capable of adjustment as regards its height and its inclination to the floor. It must be entirely of metal, or of glass and metal. An excellent table, which fulfils these requirements, is that designed by Mackenrodt (*v.* Figs. 127, 128).

For pelvic examinations and operations on or through the vagina, Mackenrodt's table can be also used by adding leg rests, and so can any of the simpler forms of gynæcological table. If such a table cannot be obtained, as when operating in a private house, the patient can be kept in the necessary position by means of Clover's crutch (*v.* Fig. 126). For examination purposes in the consulting room, some form of gynæcological couch is necessary, and of these the most generally useful form is that known as the Veit-Schroeder gynæcological couch (*v.* Fig. 1).

CHAPTER XVII.

CŒLIOTOMY.

Definition—Ventral Cœliotomy—Indications, Instruments, Operation : Drainage : Closure of the Abdominal Wound ; Kelly's Method—Operative Complications—After-treatment ; Rest, Diet, Bladder, Intestinal Tract, Dressing of Wound—Post-operative Complications—Vaginal Cœliotomy—Relative Advantages of Vaginal and Abdominal Cœliotomy—Indications, Instruments, Operations : Anterior Colpotomy, Mackenrodt's Operation, Dührssen's Operation ; Posterior Colpotomy—Paravaginal Section.

Cœliotomy (*κοιλία, lit.* a hollow, *hence* the abdomen ; *τέμνω*, I cut ; *syns.*, laparotomy [*λαπάρα*, the flank ; *τέμνω*], abdominal section) is the term applied to the opening of the peritoneal cavity. It is termed ventral or abdominal cœliotomy or vaginal cœliotomy, according as the opening is made through the abdominal walls or through the vagina.

VENTRAL CŒLIOTOMY.

In a gynæcological handbook, we are only concerned with that form of ventral cœliotomy which is required for operations on gynæcological conditions.

Indications.—Ventral cœliotomy is indicated for the following purposes :—

(1) In order to treat or remove pathological conditions of the pelvic organs, when the cure of such conditions is necessary and cannot be obtained by less radical means.

(2) In order to diagnose obscure pelvic conditions, which so affect the patient's health as to render their cure necessary.

Instruments.—The following instruments are required :—Two scalpels ; one or two dozen clip-forceps ; four pairs of scissors, one sharp-pointed, one blunt-pointed, and one curved on the flat, tolerably stout and with handles of medium length (*v.* Fig. 129),

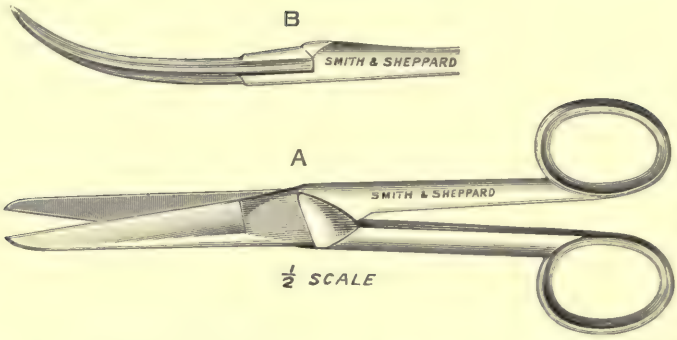


FIG. 129.—Stout scissors. A. Straight. B. Curved.

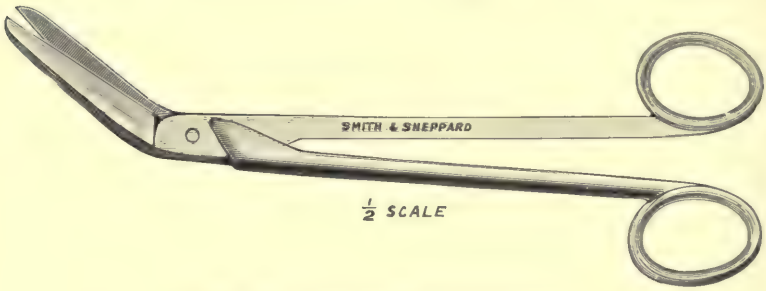


FIG. 130.—Long-handled angle scissors.

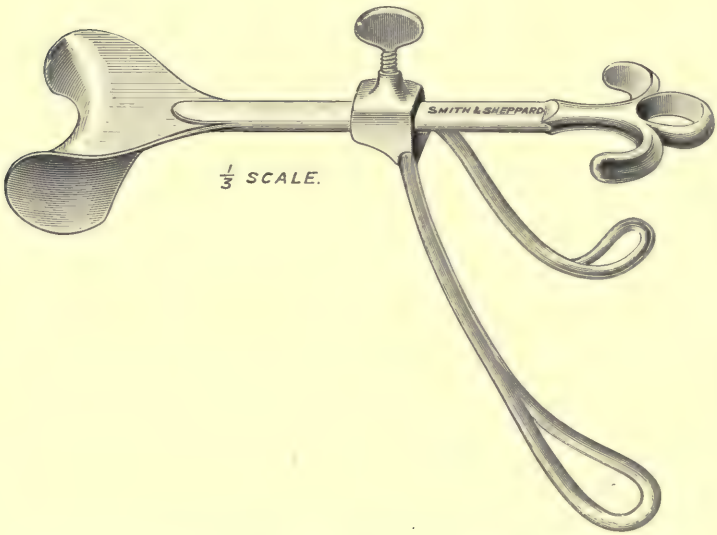


FIG. 131.—Doyen's retractor for abdominal incision, with thigh piece.

and one angle scissors with long handles (*v.* Fig. 130); retractors (*v.* Figs. 131, 132); four or five long, straight and curved, narrow-bladed clamp forceps (*v.* Fig. 149); four light and long-handled forceps with short blades, two straight and two curved (*v.* Fig. 133); three or four dozen sponges of gauze; needles and needle-holder (*v.* Figs. 140, 141); suture materials;

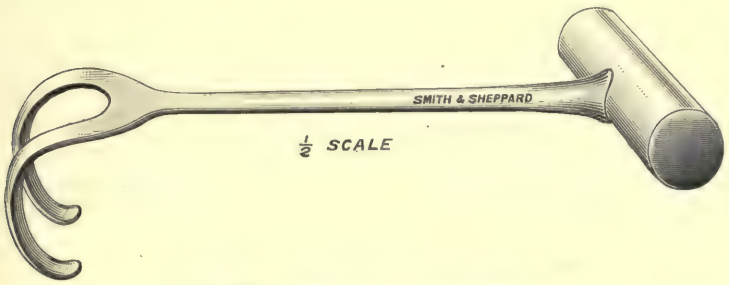


FIG. 132.—Quènu's abdominal retractor.

two dissecting forceps with sharp teeth (*v.* Fig. 142). In addition to these instruments, others are required according to the operation which it is intended to perform. These will be enumerated later when discussing the individual operations.

Operation.—Whatever form of operating table is chosen, it should be one which can easily be swung on a transverse axis,

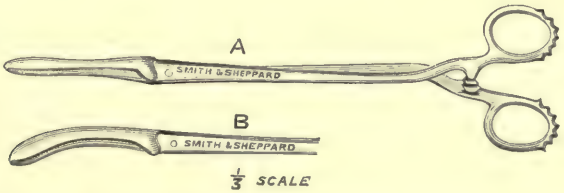


FIG. 133.—Long and slender forceps for peritoneal flaps, etc. A. Straight. B. Curved.

so as to permit of the patient being placed in Trendelenburg's position and brought back again to a horizontal position with the least amount of trouble. The patient is placed on the table, the skin disinfected as has been previously described (*r.* page 278), and the site of operation isolated from the surrounding parts by means of sterilised sheets or towels, so placed as to cover the patient completely except the site of the incision and the face.

An incision is then made in the middle line through the skin and fat down to the aponeurosis of the rectus muscle, and about two to two and a half inches in length, with its extremities equidistant from the umbilicus and the pubes. Afterwards, it can be increased in length if necessary. Bleeding vessels are caught in clip forceps, and if of large size are tied with fine silk or catgut. As soon as the aponeurosis of the muscle has been exposed, the linea alba (*v.* Fig. 134) must be found, as the incision should

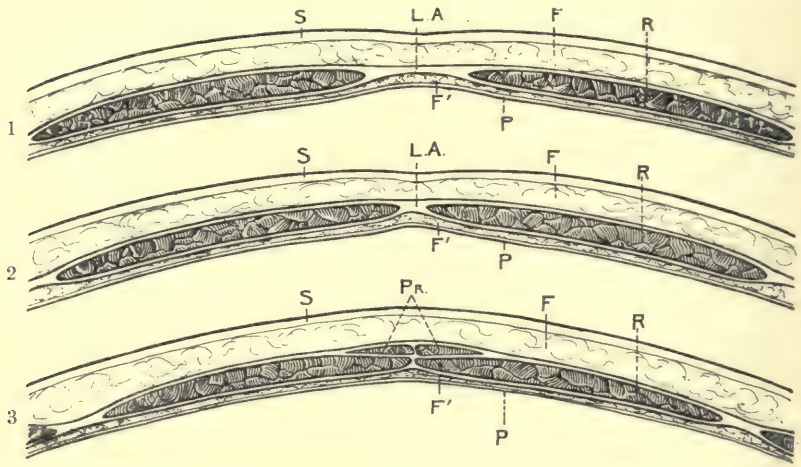


FIG. 134.—Sections of the anterior abdominal wall across the middle line and at right angles to the linea alba. 2. Section midway between umbilicus and symphysis pubis. 1. Section midway between umbilicus and 2. 3. Section midway between 2 and symphysis pubis. L.A. Linea alba. S. Skin. F. Subcutaneous fat. F'. Sub-peritoneal fat. R. Rectus muscle. Pr. Pyramidalis muscle. P. Peritoneum. (From a formalin preparation by Dr. R. A. Stoney.)

pass through it. If there is any difficulty in determining its exact position, the easiest method of doing so is to make a small incision through the aponeurosis as close as possible to the middle line and at the upper end of the exposed aponeurosis, as there the linea alba is best marked and can be most easily recognised. If this incision happens to hit the linea alba, it is then continued through it. If it does not, the point of a director is passed through it, and pushed alternately first towards one side and then towards another. In this way, the linea alba will be found, as it will cause an obstruction to the passage of the

director to one or other side, while the director can be passed outwards in the opposite direction. The accompanying drawings, made from sections of the abdominal wall in a virgin, show very clearly the alteration in the thickness and width of the linea alba at different levels between the umbilicus and the symphysis. As soon as the linea alba has been cut through, the subperitoneal fat is seen. This may either be cut with the scalpel or torn through with the handle end, or it may be picked up between two dissecting forceps and divided. Finally, the peritoneum is reached and can be recognised by sight, or by touch if a fold is picked up between the finger and thumb. Such a fold is then caught between two forceps, and a very small nick made in it with the scalpel. This allows air to rush in, and the intestines, if not adherent to the parietal peritoneum, fall back.

The patient may now be placed in Trendelenburg's position, as it is the most suitable position for almost all gynæcological operations. The incision in the peritoneum is then enlarged with the scalpel sufficiently to admit the finger, and, finally, the aponeurosis and peritoneum are divided with scissors, cutting under the guidance of the finger in the peritoneal cavity, to correspond with the size of the incision in the abdominal wall. If the incision has to be enlarged for any reason, such enlargement is carried out in a similar manner, that is, the skin is divided with a scalpel, and the deeper tissues with the scissors.

In very exceptional cases, it may be found necessary to enlarge the opening into the abdomen by means of a transverse incision across the rectus muscles at right angles to the first incision. We have occasionally found such a course necessary in cases of solid malignant tumours immovably fixed in the pelvic brim, in order to enable us to reach their lateral attachments. In such cases, a transverse incision is made with the scalpel through the skin and muscle about midway, or a little above midway, between the symphysis and the umbilicus, and extending outwards as far as is necessary. The deep epigastric artery will be divided and must be tied.

As soon as the object for which the peritoneum was opened has been effected, the peritoneal cavity must be cleansed by removing all blood and *débris* of any kind which may have found its way into it. As a preliminary to this, it is well to bring the patient back from Trendelenburg's position into the

horizontal position, in order that all fluid may find its way into the pelvis. As a rule, gauze sponges will readily remove any fluid or clots, and it is only in rare cases that it will be found necessary to wash out the peritoneal cavity. If a large quantity of septic matter has escaped from a pus tube or a suppurating cyst, and has become generalised through the peritoneal cavity, it is best to wash the latter out as thoroughly as possible. If, however, the escaped septic matter has not become generalised but has been successfully confined to the pelvis, by carefully walling off the rest of the peritoneal cavity with sponges, it is better not to wash out the cavity, lest such a procedure should cause the infection to become generalised. We have not found it necessary to wash out the peritoneal cavity on account of the escape of pus from the tubes for some time, and we are personally of opinion that peritoneal lavage does not possess a high value as a means of preventing

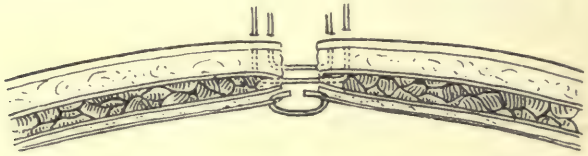


FIG. 135.—Diagram of the simplest method of suturing the abdominal wound.

sepsis. If the infecting micro-organism is of low virulence, the peritoneum is itself capable of dealing with it, and, if it is of high virulence, we do not think that any amount of washing will avail. It is however right to mention that many very high authorities advise washing out in these cases. If the patient is very much collapsed from the length of the operation and from loss of blood, it is a good practice to pour from two to six pints of normal saline solution (0·6 per cent.) into the cavity and allow it to remain there and be absorbed.

The Abdominal Wound.—The proper closure and the complete union of the abdominal wound are most important matters, in order to prevent the subsequent occurrence of ventral hernia. "The best method of closure is that which brings the tissues into exact approximation layer by layer in the order they occupied before division, and holds them there until firmly united, with the least risk of infection" (Kelly). There

are two chief ways of attaining this end. The first is the more rapid, and is therefore suitable for cases in which the saving of time is of great importance. In all other cases, the second method is preferable, as it ensures that accurate fascial approximation which alone can prevent the future occurrence of ventral hernia.

FIG. 136. FIG. 137.

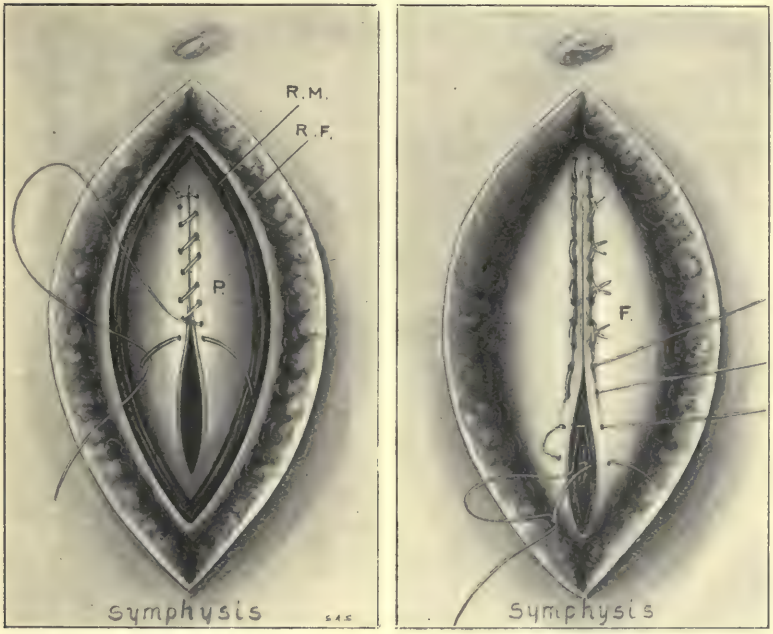


FIG. 136.—Closure of the abdominal incision. First step. The peritoneal edges are brought together by a catgut suture. P. Peritoneum. R.M. Rectus muscle. R.F. Rectus fascia.

FIG. 137.—Closure of the abdominal incision. Second step. The fascial edges are brought together with mattress sutures of silkworm gut. F. Fascia.

The first method is as follows:—The peritoneal edges are brought together by a continuous catgut suture. Silkworm-gut sutures are then inserted through the skin at intervals of half an inch along the length of the incision. They traverse the skin, fat, and fascia at one side, then pass across the wound to the corresponding point at the opposite side, and emerge through the fascia, fat and skin. They are entered a quarter of an inch from the skin edge, and traverse the fat and fascia at right angles to the

surface (*v.* Fig. 135). If there is any gaping of the skin between them after they are tied, fine catgut or silkworm-gut sutures may be inserted wherever is necessary.

The second method (Kelly's) is as follows:—The peritoneum is first sutured with a continuous catgut suture (*v.* Fig. 136). The fascia is then drawn out on both sides, and held together

FIG. 138. FIG. 139.

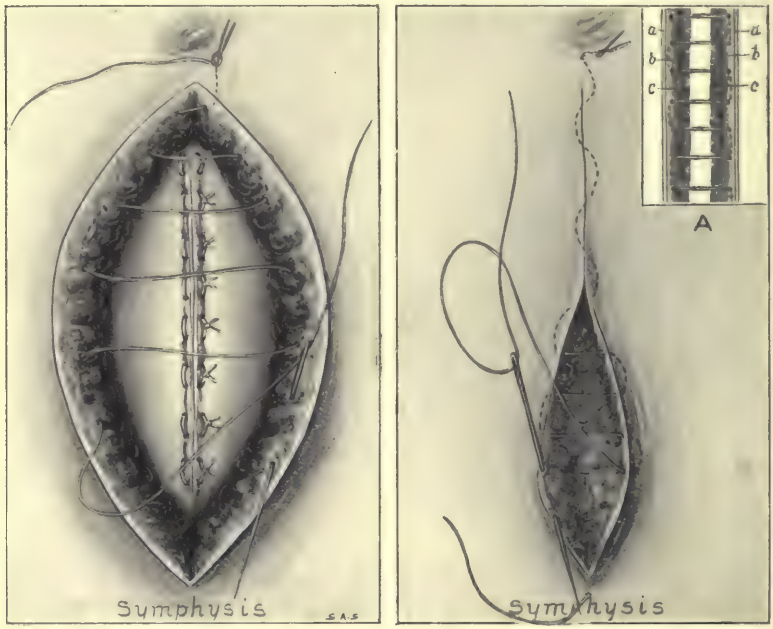


FIG. 138.—Closure of the abdominal incision Third step. The edges of the fat are laced together by a continuous silkworm-gut suture.

FIG. 139.—Closure of the abdominal incision. Fourth step. The skin edges are brought together by a continuous subcuticular suture. A. Diagram to show method of introducing the subcuticular sutures. *a*. Epidermis. *b*. Cutis vera, through which the sutures are passed. *c*. Fat.

while it is united with mattress sutures of silkworm gut. Kelly passes these sutures half an inch from the cut edge, includes in each stitch half an inch of the tissue, and places the sutures from an inch to an inch and a half apart. We, personally, prefer to place them somewhat closer together (*v.* Fig. 137). The ends are cut short, as the sutures will be buried when the subsequent row is tied. The subcutaneous fat is next brought together

by means of a continuous catgut suture, and lastly the skin by a continuous subcuticular suture of the same material (*v.* Fig. 139).

In any case in which there is a possibility of infection occurring

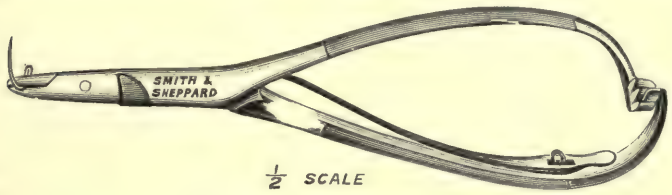


FIG. 140.—Doyen's needle holder.

in the wound, as in operations on suppurative conditions of the adnexa, pelvic peritonitis, etc., it is well to avoid the use of buried

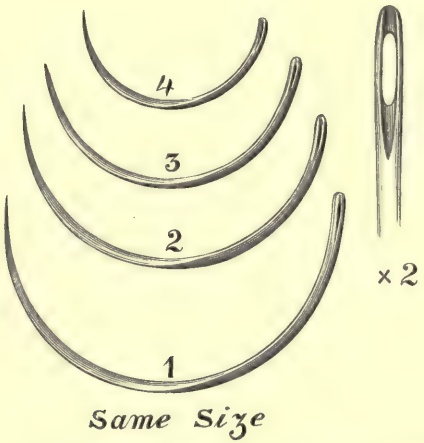


FIG. 141.—Martin's needles for gynæcological work.

silkworm-gut sutures in the fascia, and to substitute for it fairly thick chromicised catgut.

FIG. 142.—Mouse-toothed dissecting forceps. Half scale.

In the rare instances in which a transverse incision has been found necessary, its subsequent suturing must be carried out with great care, all divided muscle fibres being brought together with catgut, and all divided fascia with mattress sutures of silkworm gut, or of thick catgut, as has been described.

A simple method of bringing together the skin and subcutaneous fat is as follows:—Two long silkworm-gut sutures are knotted together. A straight glover's needle is threaded with one end of the double ligature and passed through the skin in the middle line half an inch above the upper end of the wound. The needle emerges through the subcutaneous fat, and is then passed through the fat at each side of the wound alternately, in such a manner that, when the suture is drawn tight, the cut edges of fat are, as it were, laced together (*v.* Fig. 138). The suture finally emerges through the skin half an inch below the lower end of the wound. The needle is then threaded with the other end of the double ligature, which is lying loose at the upper end of the wound, and is passed through the skin a quarter of an inch from the point at which the first suture was introduced (*v.* Fig. 139). It traverses the wound from above downwards, passing through the subcuticular layers of the skin at each side alternately, in such a manner as to lace the cut edges together. It emerges beside the first suture and a quarter of an inch distant from it, and then the two sutures are drawn sufficiently tightly to bring the cut edges together accurately, and are knotted to one another. Their removal is easy, as all that has to be done is to cut off the knot at one end, and then by pulling on the other end both sutures can be drawn out together or separately. This procedure causes little or no pain.

The final step of the operation consists in cleansing the skin of the abdominal wall and in dressing the wound. The usual method consists in drying the skin, and then dusting the wound over with boracic acid. It is then covered with several gauze sponges, over which two or three sheets of sterilised cotton wool or cellulose are laid. Another method consists in first thoroughly drying the skin by rubbing it over with a little alcohol, and then covering the incision and adjacent skin with a single thickness of gauze soaked in collodion. As this is drying, it is dusted over with boric powder, and the result is a firm and air-proof dressing, closely adhering to the skin. This is in turn covered with cellulose. Three or more straps of adhesive rubber plaster, of sufficient length to get a firm hold of the skin at the sides of the abdomen, are then placed over the cellulose, and, over all, an abdominal binder.

Drainage.—The important subject of post-operative drainage of

the peritoneal cavity demands consideration. In the early days of abdominal surgery, it was considered necessary to drain every case, as a presumed safeguard against septic peritonitis. Gradually, however, it came to be recognised that aseptic operations, at any rate, such as a hysterectomy for a myoma, did not require drainage, but rather ran a more normal post-operative course if drainage was not adopted. On the other hand, certain cases, such as those in which the peritoneal cavity is infected, apparently require drainage. Accordingly, two questions must be answered :—

(1) In what cases is drainage required?

(2) How is drainage best obtained?

(1) In what cases is drainage required? It may be regarded as definitely settled that the routine use of the drain is entirely abandoned. Experimental research has shown that the normal peritoneum is capable of absorbing large quantities of fluid (Wegner) and minute particles of foreign matter (Muscatello) in a very short time, and also of getting rid of immense numbers of pyogenic bacteria (Waterhouse, Halsted). On the other hand, experimental research also shows that in cases where the absorptive power of the peritoneum is damaged, and where as a consequence collections of unabsorbed serum or blood are present in various parts of the cavity, bacteria can multiply to a sufficient extent to give rise to a fatal peritonitis. The use of a drain is never free from danger. It may act as a means of introducing fresh infection from outside. It may cause injurious pressure on the intestines, and so produce intestinal obstruction or fistulæ. If it comes out through the abdominal wound, it weakens future union at that point and paves the way for a hernia. For these reasons, drainage must be regarded as a line of treatment whose general effect is by no means beneficial, but which may have to be used at times in order to obviate a greater danger.

Most operators agree that drainage is necessary when septic matter has escaped into the peritoneal cavity, and when both it and its cause cannot be entirely removed; *e.g.*, when a collection of pus, which there is reason to believe is still septic, bursts prior to or during operation, and when it is not possible to remove the entire sac of the abscess cavity. Drainage is also advisable in cases in which an intestine has been sutured, if it is doubtful

if the suturing has been accurately applied, or if there is any danger that it may subsequently give way (Kelly). Moreover, many operators consider drainage necessary when the oozing from surfaces denuded of peritoneum is so great that, if not drained, a considerable accumulation of blood-stained serum would result. The author is not now referring to cases in which the use of an intra-peritoneal *plug* is necessary to check hæmorrhage—such cases come under another head,—but to the use of a drain to prevent the accumulation of serum. For these cases, it is not possible to lay down a definite rule. The peritoneum, if healthy, can be apparently trusted to absorb very large quantities of fluid, but, if its function is destroyed—as by former peritonitis, drainage is called for.

Accordingly, two indications may be laid down for the use of the drain :—

(*a*) Where undoubtedly septic matter is present, or is likely to make its way into the peritoneal cavity.

(*b*) Where sterile matter—blood, serum, or pus—is likely to collect in quantities greater than the peritoneum can be expected to absorb in its existing condition.

(2) How is drainage best obtained ? Drainage can be carried out either through the lower angle of the abdominal wound, or through an opening made from the floor of Douglas' pouch into the posterior vaginal fornix. The latter route offers great advantages, as the weakening of the abdominal cicatrix is avoided, and the action of gravitation assists the escape of the fluid. It, however, possesses the disadvantages that it necessitates the making of an opening into a possibly septic vagina, and that the subsequent removal of the drain is more difficult. Nevertheless, if the vagina is healthy, vaginal drainage should be employed in almost every case in which a drain is required. In a small number of cases, it may be found advisable to have a counter-opening in the lower angle of the abdominal wound ; but, in our opinion, the number is very small. Personally, we have not drained a case through the abdominal wall for a considerable time.

If the case is one of widespread infection, as in general septic peritonitis, Kelly recommends the making of one or more lateral or posterior openings through the abdominal wall. Such openings may be made in the flanks just exterior to the erector spinæ muscle.

All drainage materials are more or less unsatisfactory. Both glass and rubber tubes are inefficient, and in addition glass is dangerous as tending to produce fæcal fistulæ by causing pressure on the intestines. Gauze, which drains well at first—if used in sufficiently large quantities—ceases to drain after a short time owing to its meshes becoming blocked by fibrin and lymph. It is, however, the only material which is at all suitable. We may

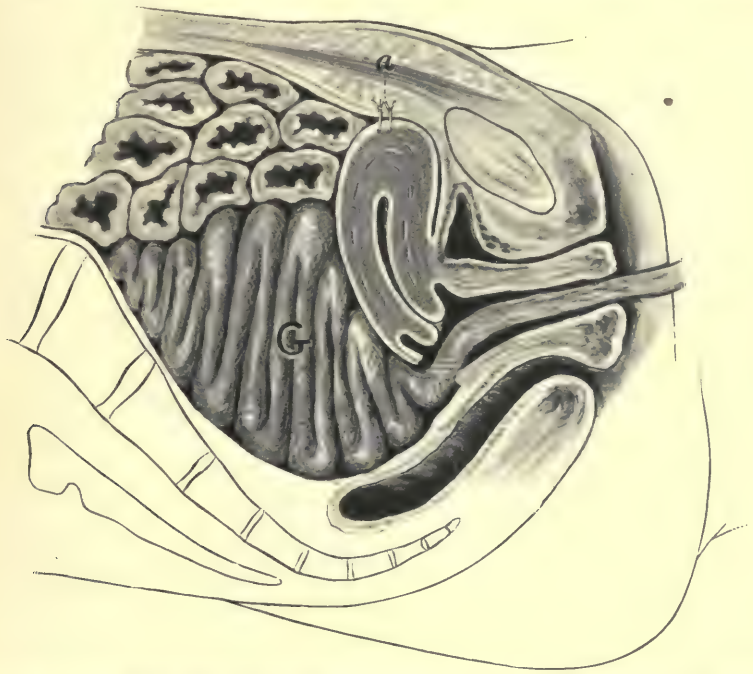


FIG. 143.—Gauze drain in Douglas' pouch, the end of the gauze passing down into the vagina. G. Gauze. *a*. Suspension sutures of the uterus.

use plain sterilised gauze, in the form of long four-fold strips two inches in width, or iodoform gauze from which the excess of iodoform has been removed by squeezing the gauze out of water (Kelly). The latter is preferable, as the fluid absorbed by the gauze rapidly decomposes, unless some antiseptic is present.

If we adopt vaginal drainage, an opening must be made from the posterior vaginal fornix into Douglas' pouch, unless such an opening already exists, as in the case of a complete hysterectomy. Such an opening is easily made by pushing up from below

a curved forceps into the fornix, and then cutting down upon it from above. One end of the gauze is caught in the forceps and drawn down, and then the pelvis is filled with the remainder (*v.* Fig. 143), care being taken that a loop of intestine does not lie below or amongst it. A portion of the gauze should be removed on the following day, and then a little more each day until the last piece comes away on the third or fourth day after

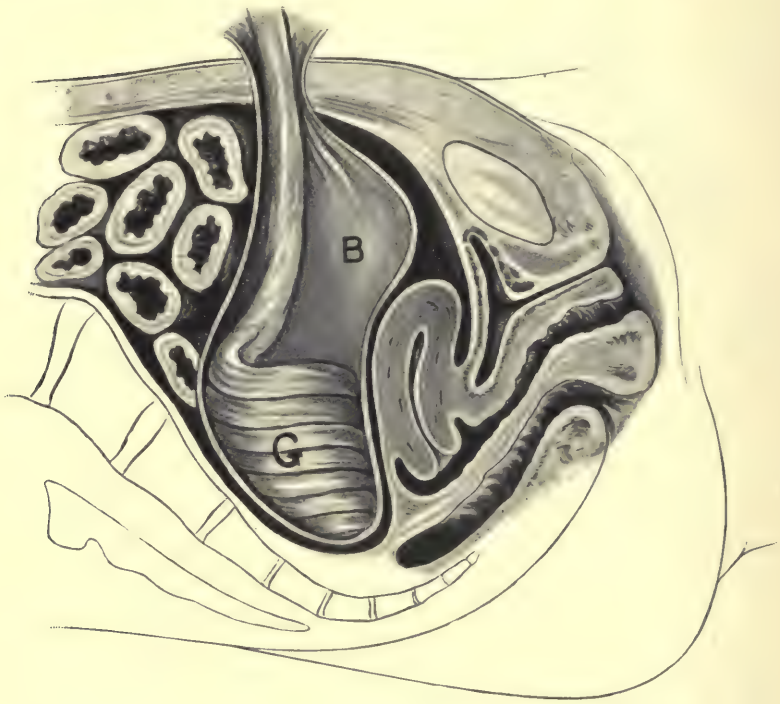


FIG. 144.—Diagram of Mikulicz' gauze bag in position. B. Gauze bag. G. Plugging.

operation. If the patient's temperature rises, the gauze should be removed completely without delay.

In some cases, the form of drain known as "Mikulicz' bag" may be useful, if we want to prevent the intestines from coming into contact with the pelvic cavity, as in cases of pelvic abscess. It may be regarded, however, as a general rule, that, if we find during an operation that the use of Mikulicz' bag is advisable, it would have been wiser and better to have operated

in the first instance through the vagina. Mikulicz' bag consists of a large piece of gauze about eighteen inches square, with a tape sewn firmly into its centre. The gauze is inverted over the fingers or a plugging forceps, with the tape on the inside, and passed into the pelvic cavity so as to line Douglas' pouch, while the edges of the gauze remain outside the abdomen. These edges are then held by an assistant, and the cavity of the bag thus formed is filled as tightly as is required with a long strip of gauze (*v.* Fig. 144). In such cases, two or three silkworm-gut sutures must be passed through the abdominal wall at the site of drainage, and prior to the introduction of the bag, to serve as a means of subsequently closing the opening. These sutures are left untied. The gauze packing should be removed on the morning or evening of the next day, and the bag itself the day following, the sutures being then tied. The great objection to the use of the bag is that it prevents the proper approximation of the aponeurosis, and so paves the way for future hernia. We have not used it for many years.

Operation Complications.—The only complication which is likely to occur in the course of a simple ventral cœliotomy is the wounding of an intestine as the peritoneum is being opened, or during the separation of adhesions. This is an accident which is especially liable to occur when the intestine has become adherent to the abdominal wall in the middle line as the result of former peritonitis. If it occurs, the cut must be immediately sutured with a fine sewing or intestinal needle and very fine silk or catgut. The sutures, which may be continuous, mattress, or interrupted, are passed in the manner introduced by Lembert, taking particular care to include a portion of the firm submucous coat (Halsted). If the tear is situated in the rectum, a fine curved needle is used instead of the usual straight one. Although a rectal tear is always difficult to reach, this inconvenience is to some extent lessened by the thickness of the wall, as this renders it more easy to insert the sutures.

After-treatment.—The after-treatment of abdominal sections may be considered under various headings :—

Rest.—After the operation the patient must be kept as quiet as possible. Violent movements while she is still semi-unconscious must be prevented, and for this purpose a special nurse must be in constant attendance. On the day following the operation the

patient may be carefully turned a little to one or other side by the nurses, but she must not be allowed to turn herself. The date at which the patient may be allowed to sit up in bed depends upon the nature of the operation and her general condition. If the case is one of simple cœliotomy, and the patient's condition is satisfactory, she may as a rule be allowed to sit up supported by a bed-rest on the tenth day after operation.

Diet.—For the first twenty-four hours, the less that is given by the mouth the better. Thirst may be relieved by hot water one or two teaspoonfuls at a time, by sips of champagne, or perhaps by ice. If the patient is very weak, nutrient enemata must be given every four hours, and the hot water may be replaced by whiskey and water (one in three). As soon as vomiting has ceased, the hot water may be replaced by barley-water, and it in turn by milk and water or barley-water, or beef essence and chicken broth may be given as an alternative. As soon as the bowels have moved, the patient may be allowed a little solid food, —tea and toast, a very small portion of the white meat of chicken, and light puddings containing eggs. As convalescence gets more advanced, the dietary may be made more extensive, but it is a good rule for the first week never to give more than one kind of food at each meal.

Bladder.—The urine must, at first, be drawn off every eight hours, and the amount measured and noted. The catheter must be passed by sight, after carefully washing the external parts. The patient should be made to pass water naturally as soon as possible, to avoid the continued use of the catheter.

Intestinal Tract.—It is an important matter to note when the patient passes flatus for the first time after the operation, as it shows that the intestines are not obstructed or paralysed. A purgative should be given on the second morning or evening after the operation, as the action of the intestines very much relieves the patient, and probably accelerates the absorption of fluid from the peritoneal cavity. If the patient is inclined to vomit, the medicine most easily borne is calomel in small and repeated doses. Commence with three grains, followed in two hours by two more, or give repeated doses of one grain every two hours until five grains have been given. This may be followed three hours after the last dose by a mild saline, such as a teaspoonful of effervescing citrate of magnesia. If the bowels still do not act, a simple

soap and water, or better, a turpentine and oil, enema must be given. If the patient has no tendency to vomit, a drachm of sulphate of magnesia dissolved in two to four teaspoonfuls of water may be given, instead of the calomel, every two hours until the bowels move. Tympanites is sometimes very marked, and causes the patient a great deal of discomfort. If it is not the result of some serious condition, such as septic peritonitis or paralysis of the bowel, it can usually be relieved by the insertion of a short rectal tube, which is allowed to remain in for half an hour or so, or by turpentine enemata. If the tympanites is very marked, relief is sometimes obtained, while waiting for the bowels to act, by applying a turpentine stupe to the abdominal wall, or by lightly drawing over the latter the point of a Paquelin's thermo-cautery heated to a dull red, in such a manner as to touch the short hairs of the skin without actually coming in contact with the epidermis itself (Kelly). If the distension has reached as low as the descending colon, relief may be given by the passage of the long rectal tube. It is, however, a very difficult matter to get this tube above the sigmoid flexure, but it is said to have been successfully done with the patient in the knee-chest position.

Dressing of the Wound.—The abdominal wound ought not to be dressed until the eighth day, unless either a drain has been used or the temperature goes above 100·5° F. or the pulse above 100. If a collodion dressing has been used, its removal is facilitated by first saturating it with ether, which softens the collodion. The sutures are removed on that day, the wound is redressed, and, if properly healed, is not again touched until the second dressing either gets soiled or falls off. The patient may be allowed to sit up in bed, if all goes well, on the tenth to the fourteenth day, and to get up on some day between the fourteenth and eighteenth according to the nature of the case and the length of the abdominal incision.

Post-operative Complications.—The following are the principal post-operative complications which may occur during the three weeks succeeding a cœliotomy. It is not possible to discuss them here in detail, and accordingly the reader is referred to one of the large text-books of gynæcology for further information :—

(1) Collapse due to the length of the operation and the anæsthesia, prolonged handling of the intestines, or hæmorrhage during the operation.

(2) Secondary hæmorrhage coming on at any time up to forty-eight hours after the operation, due to slipping of a ligature or to extensive oozing from a raw surface.

(3) Septic peritonitis and pneumonia, septicæmia and pyæmia.

(4) Re-opening of the wound from excessive coughing or vomiting, or from septic infection. This is most prone to occur within twenty-four hours of the removal of the sutures, but it is almost impossible if the fascia has been correctly sutured.

(5) Intestinal paralysis and obstruction. The former is due to sepsis, to excessive handling of the intestines or to their prolonged exposure during an operation; the latter to peritoneal adhesions, adhesion of the bowel to the raw surface, adhesion to a septic area, incarceration through a hole in the mesentery or omentum, or a twist of a loop of bowel about its own axis.

(6) Pulmonary embolism, due to the detachment of a clot from some large thrombosed vein, may occur from ten days to three or four weeks after the operation. It is an accident which is relatively more frequent after operations for the removal of myomata on account of the enormous veins which are sometimes divided.

(7) Urinary suppression may occur as the result of the accidental ligation of one or both ureters, or of the failure of the action of the kidneys due to the effect of the anæsthetic, to the length of the operation, or to septic infection.

(8) Fæcal or urinary fistulæ may form as a result of direct injury to the intestinal or bladder wall during the operation, or of necrosis or sloughing after it.

VAGINAL CŒLIOTOMY.

Vaginal cœliotomy (*syns.*, colpotomy [κόλπος, the vagina; τέμνω], vaginal section) is an operation which enables us to operate upon certain pelvic conditions with greater safety, and, in some cases, with greater ease, than does ventral cœliotomy. The opening into the peritoneal cavity can be made either through the anterior vaginal fornix, after separating the bladder from the uterus (anterior colpotomy), or through the posterior fornix, by opening directly into Douglas' pouch (posterior colpotomy) (*v.* Fig. 145).

A few words must be said with regard to the relative value of vaginal and ventral cœliotomy, especially as their relations to one another are not definitely established. Operating by the vaginal route possesses the following advantages :—

(1) There is apparently less risk of sepsis.

(2) There is little or no interference with the intestines.

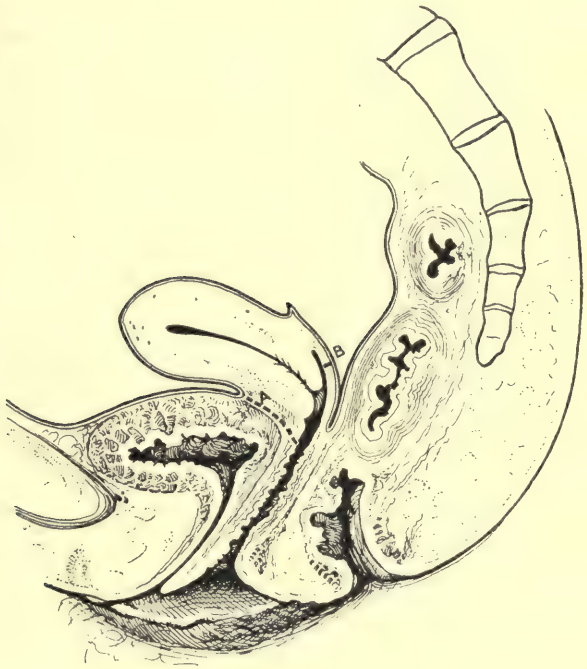


FIG. 145.—Sagittal section through the pelvis of a virgin, showing route followed in anterior and posterior colpotomy. A. Route in anterior colpotomy. B. Route in posterior colpotomy. (From a dissection by Dr. R. A. Stoney.)

(3) If pus is present, it is less likely to spread to the general peritoneal cavity, and after its evacuation better drainage can be obtained.

(4) There are some conditions which can be more easily reached by this route.

(5) There is no subsequent abdominal scar, and no risk of hernia.

The disadvantages of operating by this route are :—

(1) The operation takes longer, as a rule.

(2) In women who have not borne children, the narrowness of the vagina frequently necessitates preliminary dilatation or incision.

(3) After the peritoneal cavity has been opened, it may be found impossible to remove the tumour on account of its size, its situation, or the nature of the adhesions round it.

(4) If anterior colpotomy has been performed, it is usually necessary to finish the operation by suturing the uterus to the anterior vaginal wall, and in some cases this is an objectionable proceeding (*v.* page 469).

(5) It is not possible to deal with uterine, adnexal or intestinal adhesions with as great facility and exactitude, and to leave the pelvis in as near an approach to its normal condition as can be done by abdominal cœliotomy.

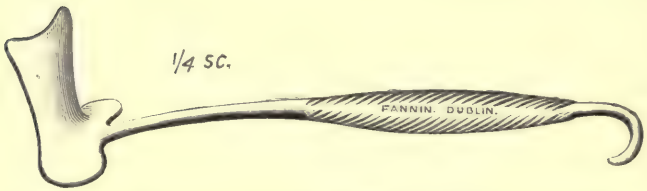


FIG. 146.—Martin's modification of Simon's posterior speculum.

Taking into consideration these advantages and disadvantages, and also remembering that recent improvements in aseptic practice, and in the technique of ventral cœliotomy, have rendered that operation in the majority of cases no more dangerous than is vaginal cœliotomy, it will, the author thinks, be found that, in most cases, ventral is to be preferred to vaginal cœliotomy. At the same time, there are certain well-recognised and positive indications for the adoption of the latter operation, and also certain relative indications for its adoption under favourable circumstances.

Indications.—There is a positive indication under all conditions for the adoption of the vaginal route for the following operations:—

(1) The drainage of abscesses in Douglas' pouch or in the parametric tissues.

(2) The drainage of a pyosalpinx or ovarian abscess, if there is reason to believe that active infection is present.

In these cases there is no doubt that the vaginal route is less dangerous, as it is possible by it to avoid the dissemination of sepsis through the peritoneal cavity.

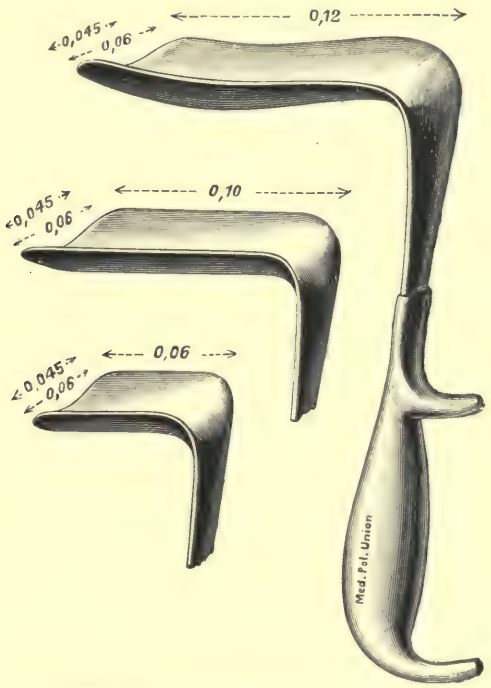


FIG. 147.—Doyen's posterior speculum.

There is a relative indication for the adoption of the vaginal route for certain operations under the following conditions :—

(1) If the vagina is sufficiently capacious to permit the necessary manipulations. Thus, a multipara is always a more suitable subject than a nullipara.

(2) If the tumour to be removed is of such a size, or capable of being so reduced in size, that it can be easily brought through the vaginal opening, and if it has no attachment above the pelvic brim.

(3) If the cervix can be drawn down at least as far as the orifice of the vagina.

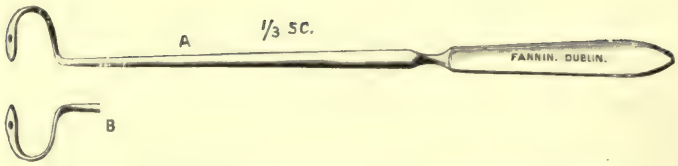


FIG. 148.—Blunt pedicle needle. A. Left-handed needle. B. Right-handed needle.

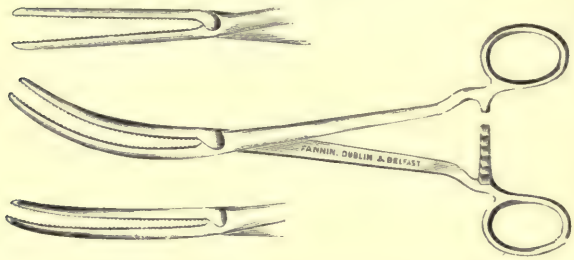


FIG. 149.—Péan's hysterectomy forceps. One-third scale. The highest forceps is straight, the middle curved on the side, the lowest curved on the flat.

FIG. 150.—Fistula forceps; useful for holding peritoneal flaps, etc. About one-fourth scale.

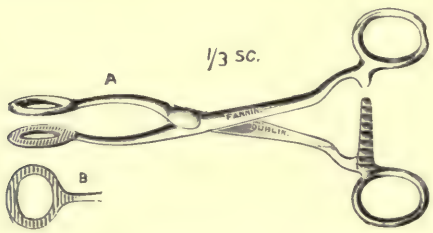


FIG. 151.—Doyen's ovary extraction forceps.

Under such conditions, the vaginal route is indicated for the following operations:—

(1) The removal of myomata or uncomplicated ovarian tumours of small size.

(2) Conservative operations on the ovaries or Fallopian tubes in certain cases.
(3) The performance of hysteropexy in certain cases.
(4) The performance of hysterectomy in certain cases.

Posterior colpotomy is the more suitable operation in the case of fluid accumulations or inflamed adherent appendages in

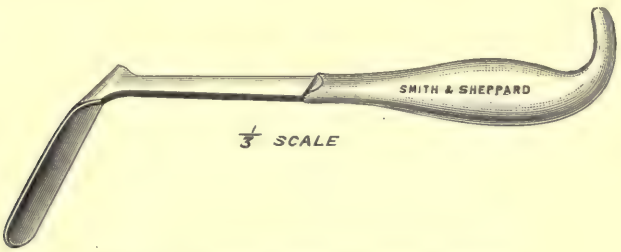


FIG. 152.—Doyen's anterior vaginal retractor.

Douglas' pouch, or for the removal of tumours growing from the posterior uterine wall.

Anterior colpotomy must be performed when vaginal fixation of the uterus is indicated, and it is more suitable for the removal of tumours growing from the anterior uterine wall and of small ovarian cysts, and for conservative operations on the appendages.

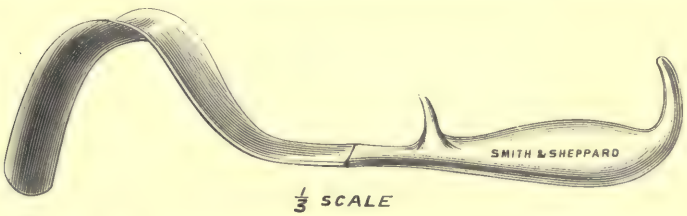


FIG. 153.—Segond's double-curve anterior vaginal retractor.

Instruments.—The following instruments are required in all cases :—A posterior speculum, Martin's or Doyen's (*v.* Figs. 146, 147) ; four American forceps (*v.* Fig. 9) ; needle-holder (*v.* Fig. 140) ; three sizes of whole-curved needles (*v.* Fig. 141) ; silk, silkworm gut, and catgut; pedicle needles (*v.* Fig. 148) ; twelve clip forceps; three or four long narrow-bladed clamp forceps, curved and straight (*v.* Fig. 149) ; four light and long-handled forceps with short blades (*v.* Fig. 133) ;

ovary forceps (*v.* Fig. 151); two lateral vaginal retractors, and an anterior retractor or *écarteur* (*v.* Figs. 152, 153); uterine sound; metal catheter; several pairs of scissors, including a pair with blunt ends, a sharp-pointed pair with medium length handles and tolerably stoutly made, and two pairs with long handles, one straight, the other curved on the flat; any form of sponge-holder, and two or three dozen sterilised muslin sponges; two scalpels; toothed dissecting forceps (*v.* Fig. 142).

FIG. 154.—Enlargement of the vaginal orifice. *a*. Site and direction of incisions.

In addition, if there is any likelihood of a ventral cœliotomy being also necessary, the instruments required for it must be at hand (*v.* page 285).

Operation.—Vaginal cœliotomy is most easily performed with the patient on a suitable operating table, such as Mackenrodt's, with leg-rests; but, if the latter is not available, a short deal table will answer the purpose provided that it is sufficiently strong. If such a table is used, the patient is kept in the gynæcological position by means of Clover's crutch, or the legs are held by assistants.

If the vagina is small, its size may be increased by packing it daily for a few days prior to the operation with iodoform

gauze, or incisions may be made in its wall as a preliminary to the operation. These incisions are made one at each side of the middle line (*v.* Fig. 154), and divide the mucous membrane and skin of the labia and the circumvaginal muscles. In order to check hæmorrhage and to keep the cut surfaces free from infection, a couple of sutures may be passed so as to bring the cut edges together from above downwards, thus changing the original vertical incision into a transverse one. These sutures are removed at the end of the operation and the wound is re-sutured

FIG. 155.—Enlargement of the vaginal orifice. A. Result of incision. B. Incision sutured temporarily at right angles to original direction.

in its correct relationship. This method of increasing the size of the vagina is limited to incision of the vaginal orifice, and must not be confused with so-called paravaginal section, which is quite a distinct operation and will be described later (*v.* page 318).

Anterior Colpotomy.—A posterior speculum is passed, and the anterior lip of the cervix seized in one or two American forceps and drawn downwards and backwards as far as possible. A sound or metal catheter is then passed into the bladder, and pushed gently in the direction of the cervix in order to ascertain how far down

the cervix the bladder extends. The mucous membrane of the anterior vaginal wall is seized in another forceps a little behind the orifice of the urethra, and both forceps are given to an assistant to hold. By drawing the one upwards and the other downwards, the mucous membrane between them is made tense. An incision is next made in the middle line, extending from half an inch below the upper forceps to just below the point to which

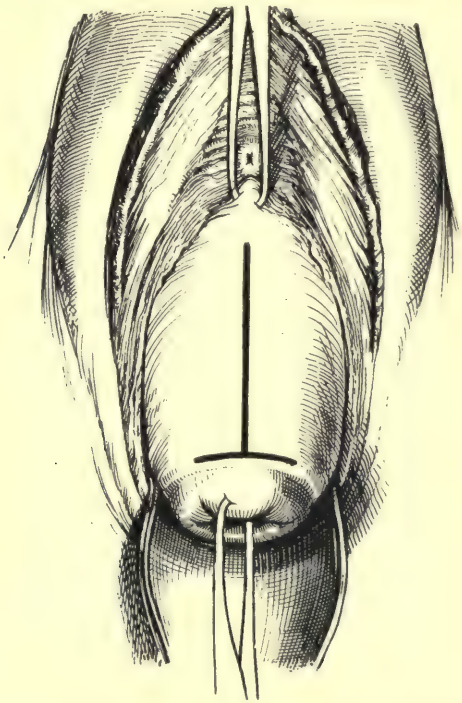


FIG. 156.—Anterior vaginal cœliotomy; first step. Incision of the anterior vaginal wall.

the bladder had been found to extend (Mackenrodt). If, as sometimes happens, the bladder does not come on to the cervix at all, the incision ends about half an inch from the tip of the cervix. Care must be taken that the incision goes completely through the thickness of the mucous membrane, but no further. A second incision is next made across the cervical end of the first, at right angles to and bisected by it, and about three-quarters of an inch in length (*v.* Fig. 156).

The mucous membrane at one side of the vertical incision is then caught in a toothed dissecting forceps and reflected outwards for about an inch, and similarly at the other side. This can be begun with the sharp end of the scalpel, but as we get further out it is best to use the blunt end only. The outlines of the bladder are then again defined by passing the sound into

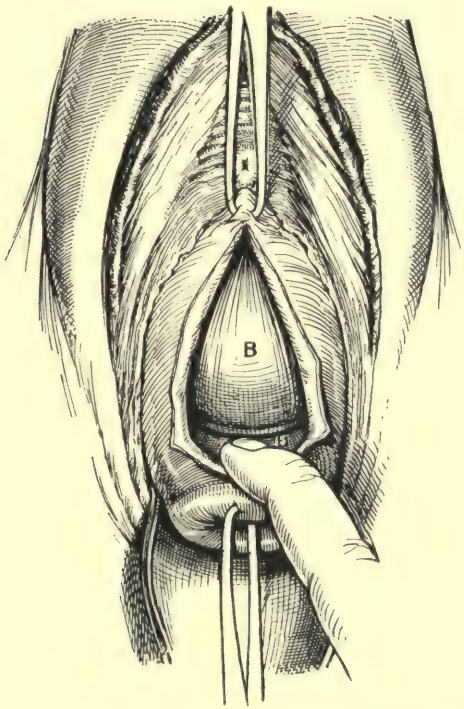


FIG. 157.—Anterior vaginal cœliotomy; second step. The vaginal mucous membrane has been dissected up laterally, and the bladder exposed. B. Bladder. U. Uterus.

it, and a transverse incision is made through the areolar tissue just below the cervical attachment of the bladder (*v.* Fig. 157). This incision should extend down to but not into the cervical tissue, as its object is to open up the loose tissue that lies between the bladder and cervix.

The operator then holds the lower bullet forceps in his left hand, and, with the fore and middle finger of his right hand pushes the bladder gently upwards, at first at the centre and

then at the sides. This pushing must always be done with the pulp of the finger pressing upon the cervical tissue, as by so doing there is not the same direct pressure on the bladder and the risk of wounding its wall is lessened. Care must be taken to detach and push up the bladder not alone in the middle line but also at the sides, as in this way the ureters, as well as the bladder, are separated from the neighbourhood of the uterus and carried upwards out of harm's way.

It is right to mention that Wertheim condemns the blunt dissection with the finger, which we have just described, on account of the liability of pushing the vesical pouch of peritoneum upwards, and so rendering the pouch more difficult to find. He advises one to catch the bladder gently with a forceps and draw it upwards so as to place the connective-tissue bands between the bladder and the cervix on the stretch, and then to divide these bands with scissors. We are sure this is the better course for the expert operator to adopt, but we recommend the neophyte to rest content with blunt dissection until such time as he has learned to distinguish with certainty between the muscle of the bladder wall and the connective tissue between the bladder and the uterus.

As soon as the bladder has been pushed off the uterus, the next step is to find the line of peritoneal reflection off the anterior wall of the uterus (*r*. Fig. 158). We can usually tell when we have got above this fold by noting the manner in which the tissues at the base of the wound glide freely over the uterine wall, when rubbed by the finger. This gliding is permitted by the fact that two layers of smooth peritoneum are in contact. It can be simulated by the bladder walls, which will also glide over one another if the bladder has not been pushed up out of reach. In order to distinguish between the two, it is usually necessary to pass a catheter into the bladder; if the bladder is still attached to the uterus, the catheter will be felt under our fingers, but if the bladder has been pushed up and there is nothing but peritoneum, the catheter will lie above the fingers.

As soon as the peritoneum is recognised, it must be opened. To do this, catch a fold of it between two clip forceps and cut between them with a blunt-pointed scissors. First one, and then two fingers are passed through the opening thus made, which is increased in size to the extent required. Wertheim advises us,

at this stage, to suture the anterior flap of peritoneum to the edges of the vaginal mucous membrane so as to protect the exposed bladder wall. A general idea of the condition of the pelvis can be then obtained by making a bimanual examination with one finger introduced through the opening.

In many cases, the next step consists in drawing out the fundus

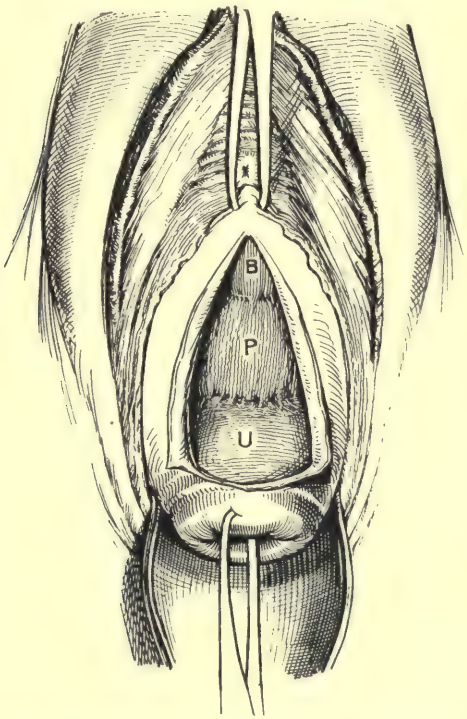


FIG. 158.—Anterior vaginal cœliotomy ; third step. The bladder has been pushed upwards, and the vesico-uterine peritoneal reflection exposed. B. Bladder. P. Peritoneum. U. Uterus.

of the uterus, in order to examine its condition. To accomplish this, the body of the uterus is caught with an American forceps, or a small and long-handled hook, as high as can be reached in the middle line, and then drawn downwards. Another forceps or hook is then applied as high above the former as possible, the forceps upon the cervix is removed, and the cervix itself is pushed upwards and backwards into the posterior fornix. As a rule, by drawing on the second forceps the fundus can be

brought out through the opening in the vaginal wall (*v.* Fig. 159), but, if it does not come readily, another forceps must be applied above the first. In some cases, where the uterus is very soft, a forceps thus applied will tear out instead of drawing the fundus down. To obviate this accident, which may give rise to troublesome hæmorrhage, sutures of medium-sized silk are inserted transversely into the uterine tissue. Each suture goes in deeply enough to

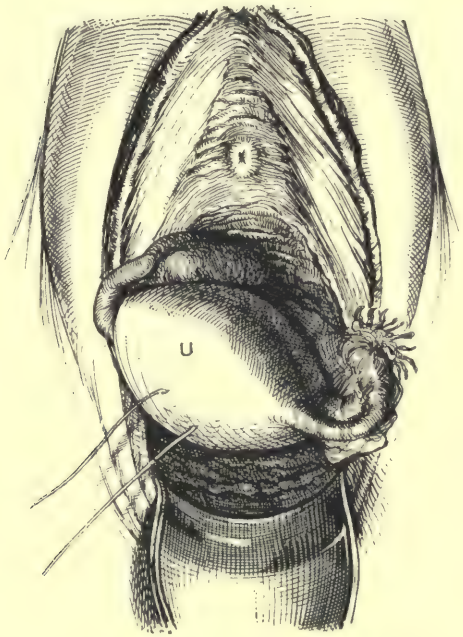


FIG. 159.—Anterior vaginal cœliotomy ; fourth step. The fundus has been drawn down through the opening in the peritoneum. The cervix has been allowed to fall back into the vaginal vault. U. Uterus.

obtain a firm hold, and, as in the case of the forceps, they are placed one above another until one of them is sufficiently high to draw the fundus out. The ends of each suture are knotted together, and, as soon as the time has come to push the uterus back again, they are removed.

If we only want to examine the appendages, it is unnecessary to extrovert the fundus. In such cases, the latter is caught with a forceps or hook, and drawn over to the side opposite to that on which we desire to expose the appendages. This brings

the cornu of the uterus into view, and the origin of the tube and the ovarian ligament can be seen. The tube can be drawn out with a forceps, and the ovary by catching and pulling upon the ovarian ligament. If the large size of the uterus, or any other reason, renders it impossible to expose the ovarian ligament, pass a finger up behind the broad ligament and inside the ovary. The ligament can thus be hooked down into the vagina and the ovarian ligament or the ovary itself rendered visible. If the ovary cannot be exposed by this means, the fundus of the uterus must be extroverted into the vagina. The ovarian ligament can then be seen and be caught with a forceps. As soon as this is done, the fundus is replaced, and the ovary brought down by drawing on its ligament. If the ovary is enlarged, or if its pedicle is short, it will be necessary to catch it in a forceps. A special forceps is made for this purpose, and is so shaped as to prevent undue pressure upon the ovary (*v.* Fig. 151).

As soon as the object for which the peritoneal cavity was opened has been effected, and all the blood, etc., has been removed by means of gauze sponges, the next and final step consists in closing the peritoneal and the vaginal openings. If vaginal fixation of the uterus has been performed, the fixation sutures will also close the opening in the peritoneum (*v.* page 469). If the condition of affairs does not call for fixation, the fundus is pushed back into the peritoneal cavity, a forceps re-applied to the cervix, which is then drawn down, and the peritoneum closed by a continuous catgut suture. Last of all, the vaginal wound is closed, also by a continuous catgut suture, which commences at the urethral end of the wound, and gradually travels to the cervical end. At first it only includes the vaginal flaps, but, as the level of the cervix is reached from which the bladder has been stripped, a portion of the cervical tissue is also included in the stitch. As the end of the wound is reached, care must be taken to suture it in such a manner as to restore its original shape. For this reason, the last few sutures must be passed vertically through the edges of the transverse incision, in such a manner as to close the latter (*v.* Fig. 160).

Dührssen's method of performing anterior colpotomy differs from Mackenrodt's, in that he makes a transverse incision through the vaginal mucous membrane, instead of a vertical incision. This incision, which is situated at the junction of the anterior

fornix and cervix, is from an inch to an inch and a half in length. Care must be taken, when extending it laterally, that the ureters are not injured. We prefer Mackenrodt's incision.

Posterior Colpotomy.—A posterior speculum is introduced, and the posterior lip of the cervix is seized in a bullet forceps, and drawn downwards and forwards. A transverse incision is then made through the mucous membrane just above the junction of

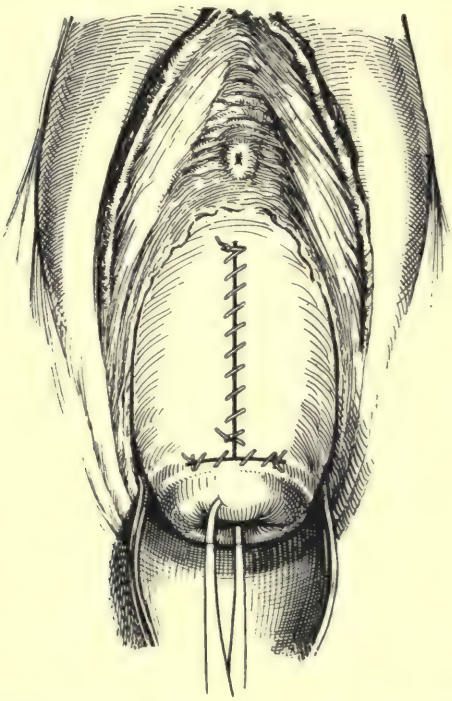


FIG. 160.—Anterior vaginal cœliotomy; final step. The vaginal wound sutured.

the posterior fornix and the cervix (*v.* Fig. 161). If a finger is passed into the opening thus made, the peritoneum will be found between the finger and the uterus, and will be recognised by noting the manner in which it glides over the uterus. Care must be taken to avoid pushing the peritoneum upwards in front of the finger. A fold of peritoneum is then caught between two clip-forceps, and a small opening made in it with a blunt-pointed scissors. Two fingers are passed through this opening, and the

wound enlarged by gradually dilating it with them until it will admit three or four fingers. Wertheim advises us to stitch the posterior flap of peritoneum to the posterior edge of the vaginal wound. The pelvis can then be explored by the finger, and the uterus and the appendages drawn down and examined. If the original incision does not give sufficient room, a vertical incision must be made at right angles to the transverse incision, and about an inch to an inch and a half in length. When making

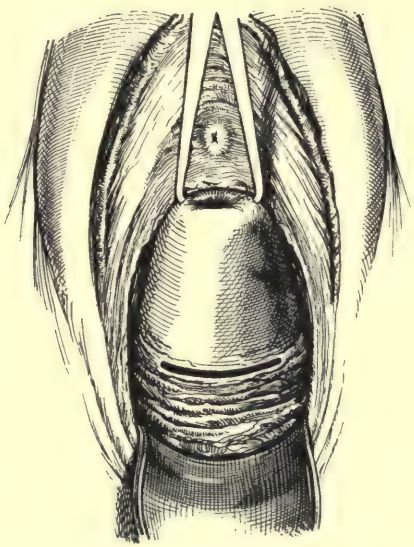


FIG. 161.—Posterior vaginal cœliotomy. The incision.

it, care must be taken to avoid injuring the rectum. The wound is finally closed by means of a catgut suture, which includes both mucous membrane and peritoneum.

Complications.—The most frequent complication of these operations is the wounding of the bladder or rectum. The bladder may be wounded during the performance of an anterior colpotomy by the first incision, while separating the bladder from the cervix, or during the removal of a tumour. The method of avoiding the first two has been mentioned, and the last can be best prevented by the use of an anterior retractor or *écarteur* while any cutting operation is going on. Similarly, the rectum may be wounded in the course of a posterior colpotomy, either when

making the vaginal incision or when opening into the peritoneal cavity.

After-treatment.—A loose tampon of iodoform gauze is placed in the vagina. The catheter is passed every six or eight hours if necessary. The tampon may be removed on the evening of the day following the operation, and purgative medicine may be given the same evening. The date at which the patient is allowed to get up depends on the nature of the operation which has been performed.

PARAVAGINAL SECTION.

Paravaginal section is the term applied to the operation in which a deep lateral incision is made vertically through the whole length of the vaginal wall, and through the surrounding structures, with the object of so enlarging the vaginal cavity as to enable operations on the uterus and the parametrium to be performed easily. The operation was introduced by Schuchardt some twelve years ago. It has not so far been widely adopted in these countries, but, thanks to the advocacy of Sinclair of Manchester, it is now becoming more generally known. It is an operation which is easy to perform, and which causes no unpleasant after-results, and it affords a relatively easy method of gaining access to the parametric structures. It is therefore possible that in some cases it will afford a more easy method of effecting the removal of cancerous outgrowths and paracervical connective tissue in malignant disease of the cervix than is afforded by the more usually performed abdominal operations. Our own experience of the operation is very small, and therefore the following description has been drawn almost entirely from Sinclair's writings on the subject.

Indications.—Paravaginal section may be indicated in the case of operations for uterine cancer, or of any other operation in which it is desired to obtain easy access to the parametric structures.

Instruments.—The instruments required are the same as those already described for vaginal cœliotomy (*v.* page 307).

Operation.—The position of the patient is similar to that adopted in vaginal cœliotomy. Two assistants are required, one at each side. The operation is performed as follows:—The operator seizes the perinæum in the middle line with the thumb and forefinger of the left hand, the assistant on his right holding

the left labium about the middle and putting the parts slightly on the stretch. The operator then cuts through the labium between the two sets of fingers, and continues the incision downwards and

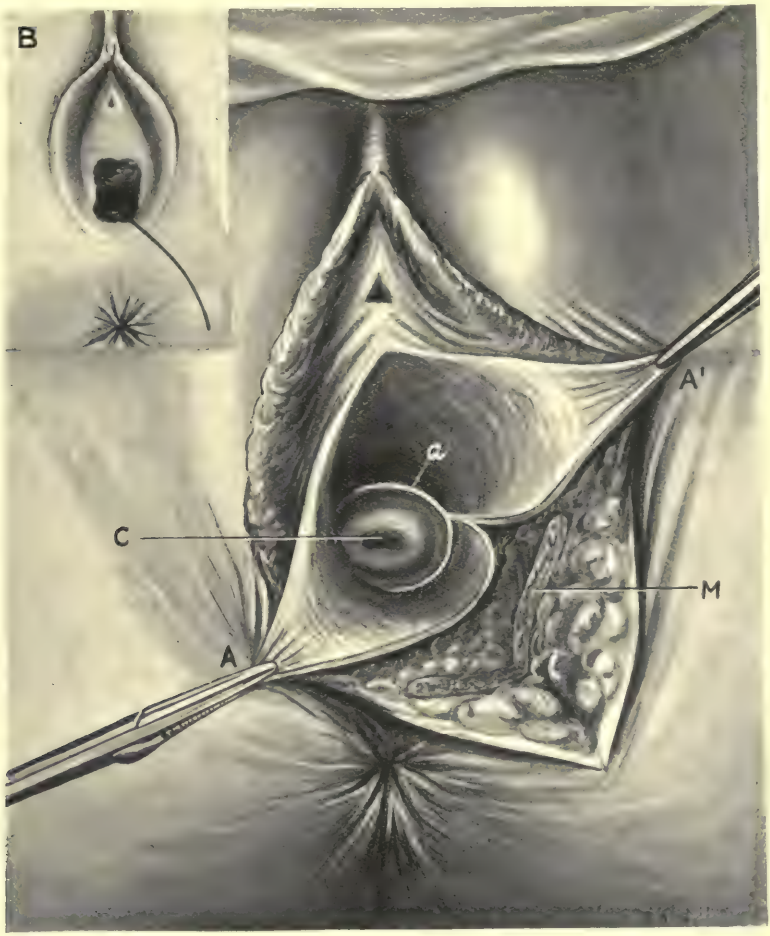


FIG. 162.—Paravaginal section. The result of the paravaginal incision. A. A^1. Points at the vaginal outlet which were in contact before the incision was made. *a*. Circular incision round cervix. C. Cervix. M. Cut edge of levator ani muscle. B. Diagram showing course of incision externally. (Compare this drawing with Fig. 3, which shows the condition of the external genitals in the same subject prior to the paravaginal section.)

outwards in a curve round, but well free of, the anus until it reaches the coccygeal region (*r*. Fig. 162, B). This incision cuts through the lower part of the levator ani muscle. The incision is

then carried upwards along the whole length of the vagina to the cervico-vaginal junction, which it meets on the left side of the posterior fornix. As the hæmorrhage from this incision is as a rule very free, all bleeding points must now be caught in clip-forceps and, where necessary, tied. Then, by small incisions and blunt dissection with the handle of the scalpel, the incision is extended into the ischio-rectal fossa to the necessary extent. This completes the first stage of the operation (*v.* Fig. 162).

The second stage consists in making a circular incision round the vault of the vagina, so as to separate the vaginal portion of the cervix and to gain access to the broad ligaments. The distance, at which this incision is made from the external os, varies according to the nature of the case and the size of the tumour which has to be brought through the opening. In cases of carcinoma, it should be made as far as possible from the cervix, as this facilitates the separation of the bladder and the isolation of the ureters. This incision made, the bladder is pushed upwards, the peritoneum exposed and incised in front, and Douglas' pouch opened behind just as in vaginal hysterectomy (*v.* page 450), with which operation the remaining steps of this stage are identical.

The object with which the operation was performed having been effected, the final stage of the operation is the suture of the original incision. The closing of the wound is greatly facilitated by the application of forceps to the angles of the vagina at the junction of the paravaginal and the circular incisions, and also to the mucous membrane of the vaginal orifice at each side of the incision. The first step in the suturing is the application of a suture at the upper of these two points, in such a manner as to bring the top edges of the vaginal incision together. The wound in the vault of the vagina, *i.e.*, that made by the circular incision through which the uterus was extracted, is next closed as in vaginal hysterectomy (*v.* page 453). The edges of the vaginal incision are then brought together with interrupted sutures of catgut or silk, but, before these are tied, the divided edges of the levator ani muscle are sutured with buried sutures of thick catgut. This part of the operation we consider to be essential in order to restore the original strength of the pelvic floor. The vaginal sutures are then tied, and lastly the skin incision is brought together by deeply placed sutures of silkworm-gut or silk. Lastly, the vagina

is packed with iodoform gauze, the wound is dusted with boric powder, and an aseptic dressing is applied and kept in position with a T binder.

Complications.—The only complication, other than those common to vaginal cœliotomy, is the wounding of the rectum during the initial incision. Such an accident can, however, be easily avoided if the operator bears in mind the possibility of its occurrence. If the levator ani muscle is not properly sutured or does not unite owing to infection, the result is very similar to that of a deep perinæal laceration during labour.

CHAPTER XVIII.

OPERATIONS ON THE URETHRA AND BLADDER.

Removal of an Urethral Caruncle. Excision of Prolapsed Urethra. Dudley's Operation for Urinary Incontinence. Operations for the Cure of Vesico-vaginal Fistula ; Marion Sims', Sänger's, Rutherford Morison's, Dudley's, Mackenrodt's, Trendelenburg's—Vesico-cervical and -uterine Fistulæ—Urethral and Ureteral Fistulæ—Artificial Vesico-vaginal Fistula. Cystoscopy—Kelly's Cystoscope —Nitze's Cystoscope.

REMOVAL OF AN URETHRAL CARUNCLE.

THE removal of an urethral caruncle is an extremely simple operation.

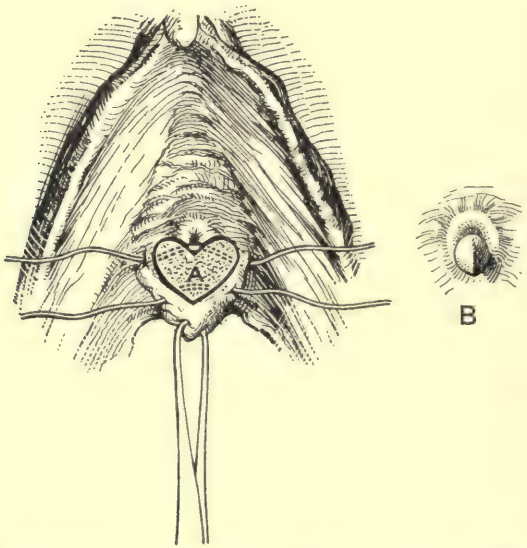


FIG. 163.—Removal of an urethral caruncle. A. The resultant wound with the sutures in position. B. The caruncle before removal.

Indications.—An urethral caruncle which causes either hæmorrhage or pain should be removed.

Instruments.—A sharp-pointed scissors; two small whole-curved

needles; needle-holder; toothed dissecting forceps; posterior speculum (*v.* Figs. 140, 141, 142, 146, 147).

Operation.—A V-shaped incision is made through the vaginal mucous membrane, in such a manner as to enclose the caruncle between the limbs of the V, and the orifice of the urethra (*v.* Fig. 163). The caruncle is then seized in the forceps and dissected out. Finally, the edges of the wound are brought together by fine silk or silkworm-gut sutures passed completely below the raw surface.

After-treatment.—The wound must be kept as clean and dry as possible. With this object, immediately after the operation it is dusted with boracic acid, and covered with a sterilised pad kept in place by a T bandage. This dressing should be changed each time the patient passes water, and fresh powder and a new pad should be applied. The sutures should be removed on the fourth or fifth day.

EXCISION OF PROLAPSED URETHRA.

The excision of the prolapsed portion of mucous membrane which constitutes an urethrocele is also a simple operation.

Indications.—A prolapse of the urethral mucous membrane, which causes interference with micturition, pain, or hæmorrhage, will require to be excised.

Instruments.—As for urethral caruncle (*v.* page 322).

Operation.—Make an incision round the orifice of the urethra, along the junction of the urethral and vaginal mucous membrane. With the scissors, dissect up the urethra from the subjacent tissue, until the prolapsed portion is isolated. The latter is then cut off with scissors, and finally the urethral mucous membrane is sutured to the edge of the surrounding vaginal mucous membrane with a continuous suture of fine silk or catgut.

After-treatment.—The after-treatment is the same as for urethral caruncle.

OPERATION FOR CERTAIN FORMS OF URINARY INCONTINENCE.

Dudley has described and practised an operation for the relief of a common form of urinary incontinence which is met with

in multiparous women, and which is due to traumata during parturition. In these cases there is usually more or less injury

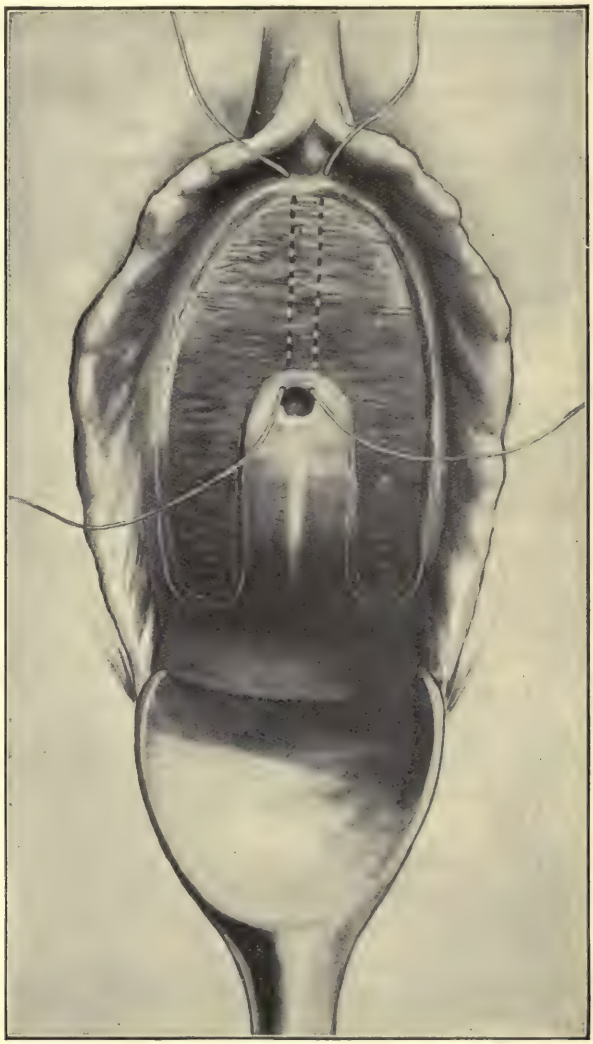


FIG. 164.—Dudley's operation for relief of urinary incontinence due to relaxed sphincter. The horseshoe-shaped area of denudation.

of the pelvic floor, and a separation of the urethra from the back of the symphysis. The incontinence is not continual, but is characterised by the occasional escape of urine especially as a

result of coughing, straining, or some sudden change of position. It is probably the result of weakness of the sphincter. The

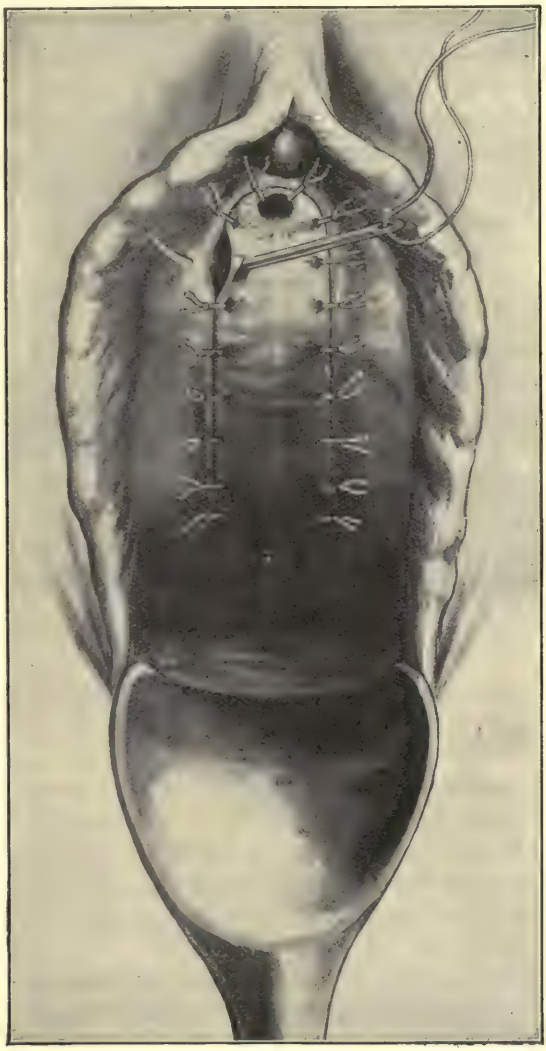


FIG. 165.—Dudley's operation for relief of urinary incontinence due to relaxed sphincter. The sutures in position and tied. Note the new position of the urethral orifice.

object of the operation is to replace in a more normal position the sagging and displaced urethra, and, by lateral traction on the

latter, to bring its walls into close contact, and so to overcome the sacculation which is said to occur in these cases at the neck of the bladder.

Instruments.—The instruments required are the same as for the removal of an urethral caruncle.

Operation.—The operation consists of two steps. The first step is the denudation of a horseshoe-shaped area between the orifice of the urethra and the clitoris, as shown in Fig. 164. From this area, the mucous membrane must be completely removed. The second step consists in drawing the urethra forwards by suturing with silkworm-gut sutures the convex summit of mucous membrane immediately in front of the urethra to the concave edge of mucous membrane immediately behind the clitoris (*v.* Fig. 165). This brings the urethral orifice forwards, and the final step consists in suturing with similar sutures the lateral edges of the horse-shoe together (*v.* Fig. 165). The operation is a very simple one, and, as it has proved successful in Dudley's hands, it is worth a trial in suitable cases.

After-treatment.—The after-treatment is the same as in the case of the removal of an urethral caruncle. The stitches should not, however, be removed for at least a week, and may be left even longer if they are not causing any irritation.

OPERATIONS FOR THE CURE OF VESICO-VAGINAL FISTULÆ.

So many operations have been described from time to time for the cure of vesico-vaginal fistulæ, that it is impossible to describe them all. Accordingly, only those which are in common use, or which we consider to be worthy of attention, will be mentioned.

Instruments.—A posterior speculum; lateral retractors; medium and small whole-curved needles; a needle-holder; small sharp-pointed scissors with rather long handles; scalpels; a couple of American forceps; toothed dissecting forceps (*v.* Figs. 146, 147, 141, 140, 9, 142).

Operation.—There are three operations, any one of which is suitable for small vesico-vaginal fistulæ:—

(A) Marion Sims' operation.

(B) Sänger's flap-splitting operation.

(C) Rutherford Morison's operation.

(A) **Marion Sims' Operation.**—Marion Sims' operation is the classical operation which was universally adopted until comparatively recent years. It is still much used for small fistulæ, but the technique has been considerably altered. With the patient in the dorsal position, the fistula is exposed by means of

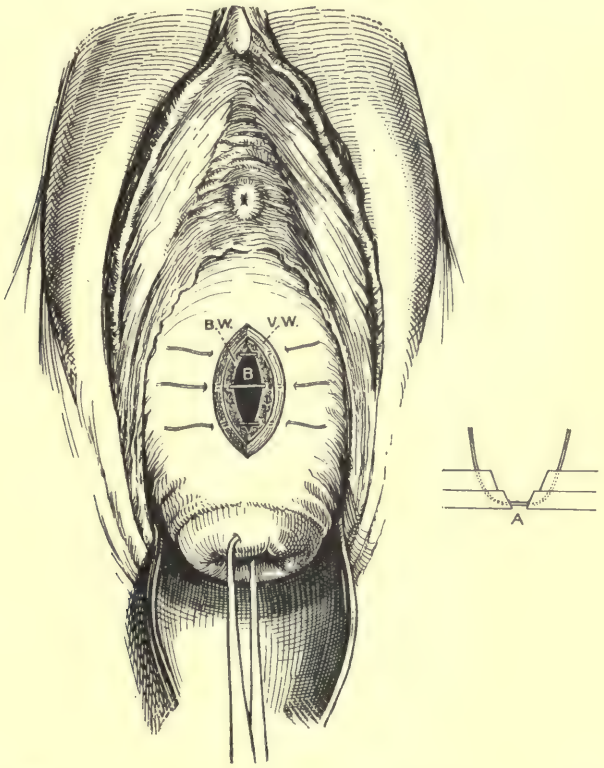


FIG. 166.*—Marion Sims' operation for vesico-vaginal fistula. The method of inserting the sutures. B. Bladder cavity. B.W. Bladder wall. V.W. Vaginal wall. A. A suture in position.

a speculum and lateral retractors if necessary. It is then drawn downwards as far as possible, by means of an American forceps on the cervix, or on the vaginal mucous membrane just above its upper edge, as suits best. The cicatricial tissue surrounding the fistula is carefully dissected away, if possible in a complete

* In this and the following diagrams the cervix appears as though drawn outside the vulva by a forceps. This is done in order to expose more fully the anterior vaginal wall; but in practice, in many cases, it will be found to be impossible to draw it down so far during the operation.

ring, down to, but not including, the bladder mucous membrane (*v.* Fig. 166). Finally, sutures of silkworm-gut are passed, half a centimetre ($\frac{2}{5}$in.) apart, and in a direction at right angles to the long axis of the fistula. These sutures are entered about three millimetres ($\frac{1}{8}$in.) from the edge, and traverse the entire wall with the exception of the bladder mucous membrane. They pass

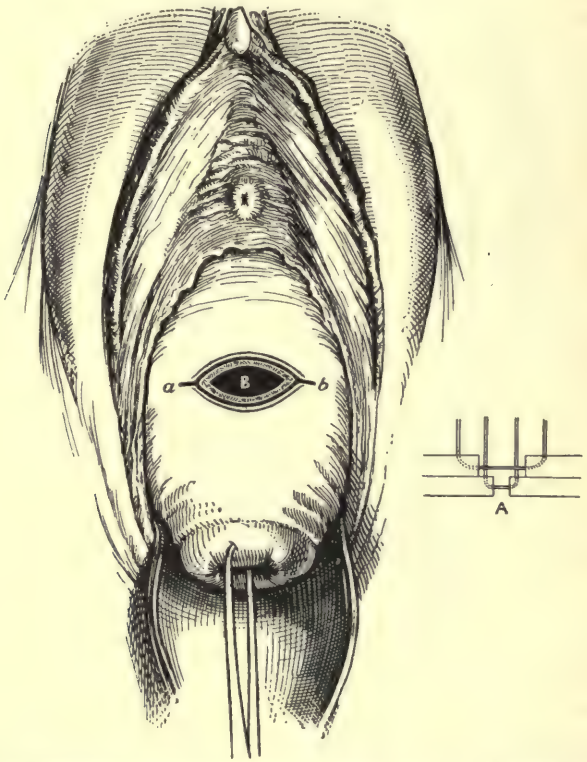


FIG. 167.—Sänger's operation for vesico-vaginal fistula. *a*, *b*. The incision. B. Cavity of bladder. A. A superficial and a deep suture in position.

across the fistula to enter the opposite wall just outside the bladder mucous membrane, and emerge at the corresponding point on the vaginal wall to that at which they were entered (*v.* Fig. 166, A). When the sutures are tied, any puckering of the vaginal mucous membrane between them is adjusted by means of fine catgut sutures.

(B) **Sänger's Operation.**—An incision is made with a fine scalpel round the fistula at the junction of the vaginal and bladder

mucous membranes. This incision is extended transversely at both sides for about a centimetre (*v.* Fig. 167). The vaginal mucous membrane is then dissected off the bladder wall for a distance of about an inch above and below the transverse incision, so that two lips—an upper and a lower—are formed from it. The sutures are passed in two layers. The first includes the bladder wall with the exception of the mucous membrane,

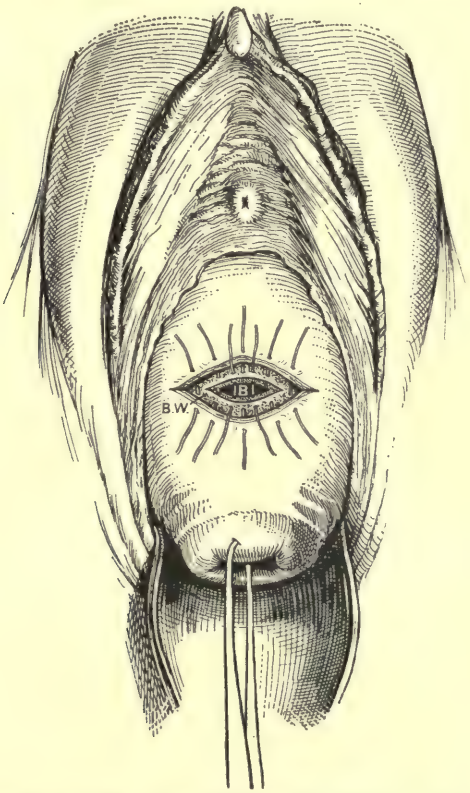


FIG. 168.—Sänger's operation for vesico-vaginal fistula. The vaginal mucous membrane has been reflected up and down, and the sutures inserted. B.W. Bladder wall. B. Cavity of bladder.

and is of catgut. The second includes the entire thickness of the vaginal mucous membrane, and is of thin silkworm-gut (*v.* Figs. 167 A, 168).

(c) **Rutherford Morison's Operation.**—This operation is well suited for small fistulæ. The first step consists in making a horseshoe-shaped incision through the vaginal mucous membrane,

so placed that the open end of the shoe is turned towards the cervix, while the fistula lies at the summit of the convexity (*v.* Fig. 169). The portion of mucous membrane thus marked out is dissected up, until it is only attached to the vagina at the open end of the shoe, and its edges are trimmed round so as to

FIG. 169.

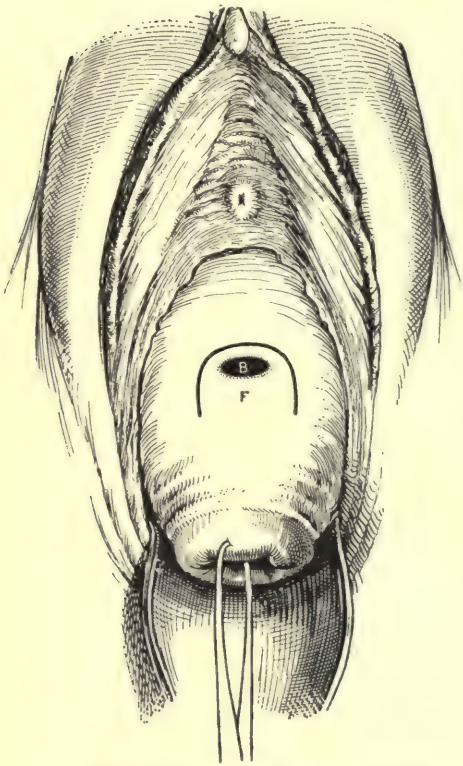


FIG. 170.

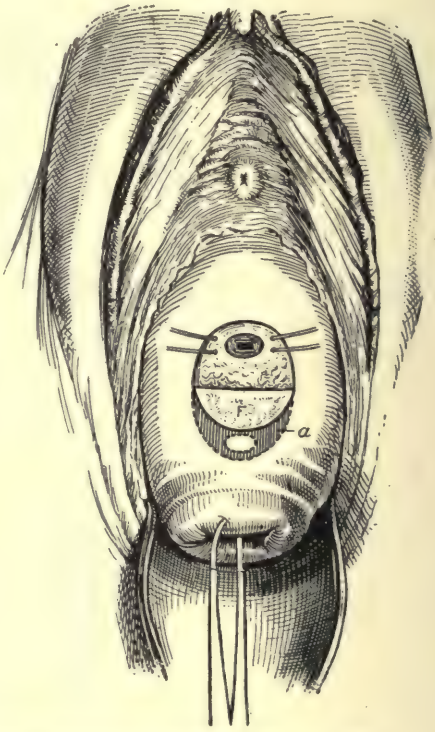


FIG. 169.—Rutherford Morison's operation for vesico-vaginal fistula. The incision. B. The fistula. F. The flap.

FIG. 170.—Rutherford Morison's operation for vesico-vaginal fistula. The horse-shoe-shaped flap of mucous membrane has been reflected downwards. The sutures in the bladder wall are shown. F. The shortened flap. *a*. The portion to be removed.

remove the former vaginal orifice of the fistula. Next, the edges of the fistula in the bladder wall are pared, and the opening closed by catgut sutures as in Sänger's operation (*v.* Fig. 170). Finally, the vaginal flap is sutured in its former position with silkworm-gut sutures (*v.* Fig. 171). By this means, the opening

in the bladder wall is covered by an unbroken layer of the vaginal mucous membrane.

The radical cure of large vesico-vaginal fistulæ is usually a matter of very great difficulty, owing to the cicatricial contraction and distortion by which such fistulæ are usually accompanied. To give an instance of the difficulties of operation, it may be

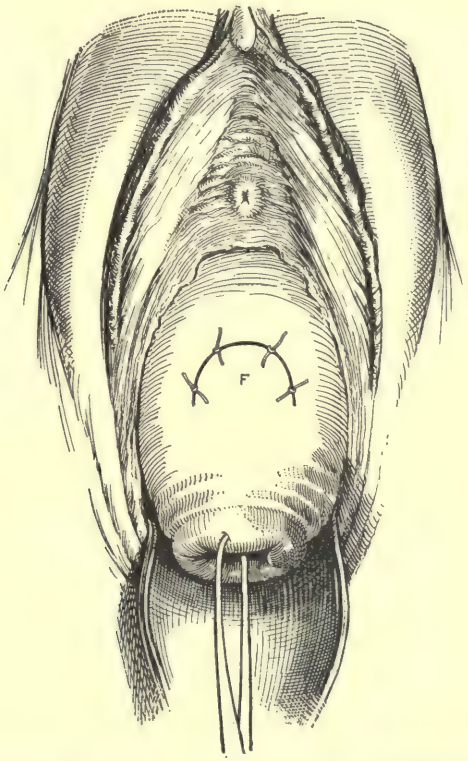


FIG. 171.—Rutherford Morison's operation for vesico-vaginal fistula. The flap has been drawn back into position and the sutures inserted.

mentioned that Dudley succeeded in curing a patient only after a series of nineteen operations spread over a period of five years.

For large vesico-vaginal fistulæ, three operations have been designed and successfully carried out:—

(A) Dudley's operation.
(B) Mackenrodt's operation.
(C) Trendelenburg's operation.

(A) **Dudley's Operation.**—Dudley's operation will be most clearly understood by looking at the accompanying drawings (*v.* Figs. 172, 173). The first step consists in denuding the edge of the

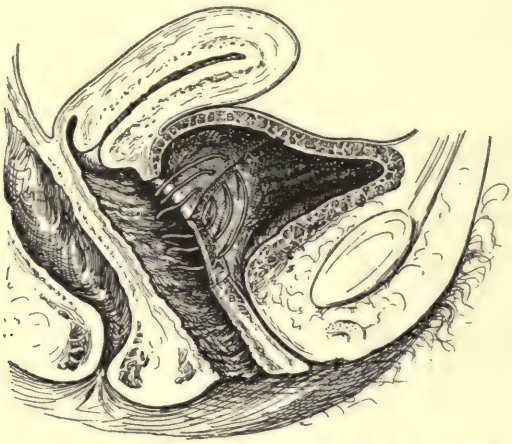


FIG. 172.—Dudley's operation for vesico-vaginal fistula. Showing the denudation of the lower half of the edge of the fistula, and of a strip running across the fundus of the bladder. The sutures are shown in position.

FIG. 173.—Dudley's operation for vesico-vaginal fistula. The sutures are tied. Note the diminution in size of the bladder and the manner in which a portion of the bladder wall is turned outwards into the vagina. B. Extroverted portion of bladder wall.

lower half of the fistula. A strip of mucous membrane, of similar width to the denuded edge, is then removed from the fundus of the bladder. This strip runs horizontally across the latter,

commencing at the left hand end of the denuded edge of the fistula, and ending at the right hand end of the same edge. It is situated an inch in front of the superior or undenuded edge of the fistula (*v.* Fig. 172). By means of interrupted silkworm-gut sutures, the denuded edge is then sutured to this strip. The result is

FIG. 174.

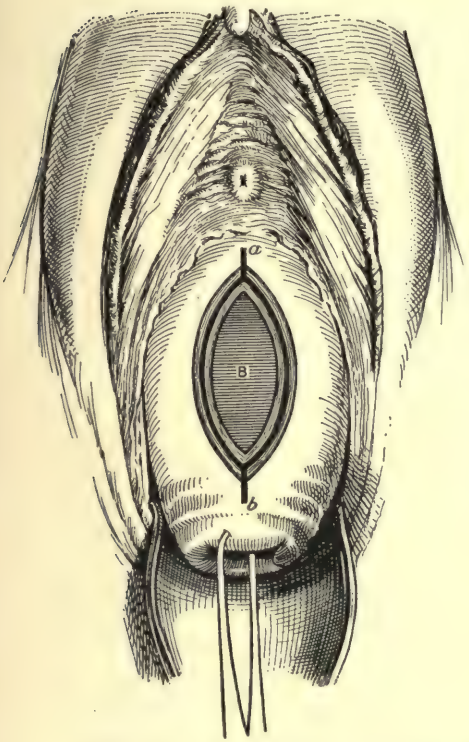


FIG. 175.

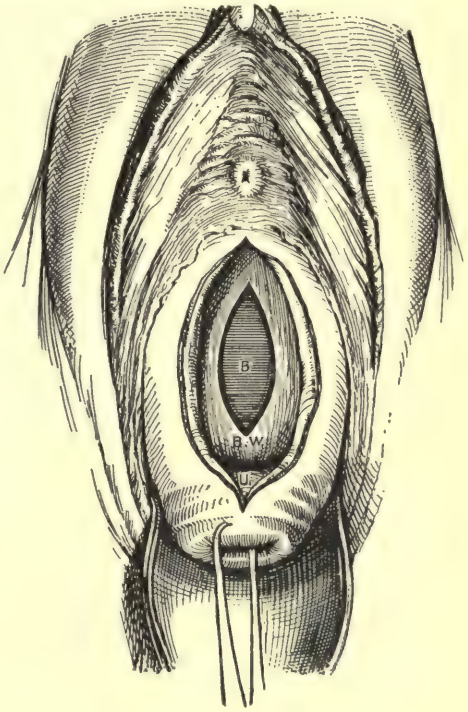


FIG. 174.—Mackenrodt's operation for vesico-vaginal fistula. *a*, *b*. The incision. B. The bladder cavity.

FIG. 175.—Mackenrodt's operation for vesico-vaginal fistula. The vaginal walls have been separated in all directions (compare with Fig. 176). B.W. Bladder wall. U. Cervix.

that the portion of bladder wall which lay between the strip and the undenuded edge of the fistula is turned outwards into the vagina and forms a portion of the vesico-vaginal septum, while the bladder itself is correspondingly reduced in size (*v.* Fig. 173).

(B) **Mackenrodt's Operation.**—Mackenrodt's operation is, briefly, as follows:—An incision is made in the middle line of the anterior vaginal wall down to the bladder wall. It crosses the

fistula, and extends from a little below the cervico-vaginal junction to a little above the orifice of the urethra (*v.* Fig. 174). The edges of the fistula are then split, and with the handle of the scalpel the vaginal wall is separated from the bladder all round (*v.* Fig. 175). This separation extends up to the utero-vesical peritoneum (*v.* Fig. 176). The bladder walls thus set free are pulled together and sutured, having first removed the scar-tissue round the edges of the opening. Finally, the vaginal wound is closed by drawing its edges together with sutures (*v.* Figs. 177, 178).

FIG. 176.—Mackenrodt's operation for vesico-vaginal fistula. This represents in sagittal section the same stages of the operation as in Fig. 175.

(c) **Trendelenburg's Operation.**—In cases in which the fistula cannot be brought down sufficiently close to the vulva to afford access to it, owing to the amount of cicatricial tissue, Trendelenburg recommended the following operation:—A supra-pubic opening is made into the bladder through a transverse incision slightly above the symphysis. The vesical aspect of the fistula is thus exposed, the edges are pared, and the necessary sutures are passed by means of two needles, so that the ends project into the vagina. These sutures are then tied from the vagina, and the openings in the anterior bladder wall and in the abdominal wall are closed. It may be advisable to leave a drainage-tube in the supra-pubic opening for a few days, and to oblige the patient to lie in a semi-prone position so that the urine may escape freely and not come into contact with the vaginal fistula.

After-treatment.—The vagina is lightly plugged with iodoform

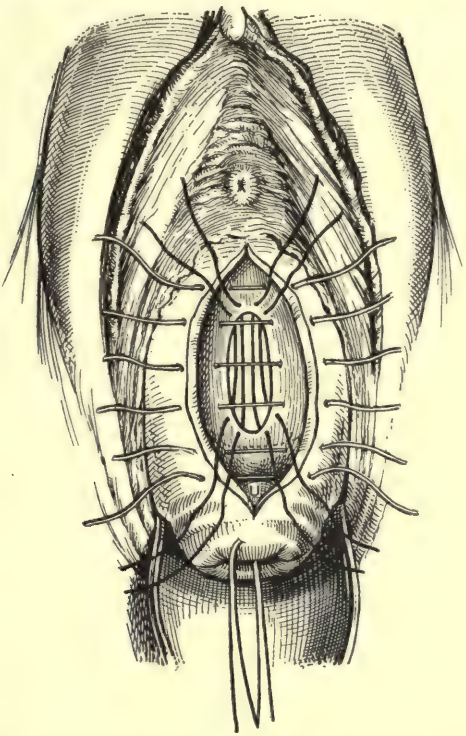


FIG. 177.—Mackenrodt's operation for vesico-vaginal fistula. The sutures in position. The black sutures are in the bladder wall, the white are drawing together the vaginal flaps. (Compare with Fig. 178.)

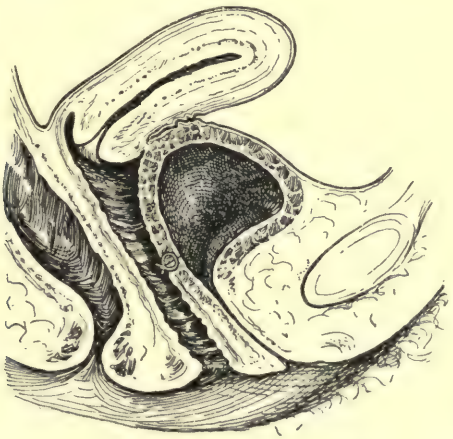


FIG. 178.—Mackenrodt's operation for vesico-vaginal fistula. This shows in sagittal section the condition of the parts when the bladder sutures are tied, as Fig. 177.

gauze, which is removed the next day. A catheter must be passed every three hours for the first three or four days. In some cases, it may be thought advisable to leave one in permanently for several days. If this is done, the bladder should be irrigated with boracic lotion, two or three times a day. A useful method of preventing contamination of the wound is as follows:—Raise the foot of the bed, so that the fundus becomes the lowest part of the bladder. Pass the top of the catheter up to the fundus, and keep it in such a position by bands of rubber plaster fastened round its outer end. Then connect the catheter by means of a rubber tube with some form of suction apparatus, which will cause slight and continuous suction, and thus remove urine as it collects at the fundus of the bladder. A simple suction apparatus can be made with a water jar possessing a tap and a narrow neck. The tap is kept slightly open, while the neck is closed by a cork, through which passes a glass tube, over which is fastened the other end of the rubber tube coming from the catheter. The sutures are removed on the tenth day.

VESICO-CERVICAL AND VESICO-UTERINE FISTULÆ.

Vesico-cervical and -uterine fistulæ can be operated on either through the vagina, or through a supra-pubic opening. In the former case, the bladder is separated from the uterus, and the operation resembles Mackenrodt's operation for vesico-vaginal fistulæ, which has been just described. In the latter case, the operation is similar to that for vesico-vaginal fistulæ described by Trendelenburg.

In some cases, these fistulæ have been operated on through the usual mesial incision made in abdominal cœliotomy, the fistula being reached by opening the peritoneum at the base of the utero-vesical *cul-de-sac* (Bardenheuer and Dittel).

URETHRAL AND URETERAL FISTULÆ.

Urethral and ureteral fistulæ require for their cure so very many different forms of operations, according to the nature of each individual case, that it would not be possible to enter into them in a book of this size. The reader is accordingly referred to the large text-books for the necessary information.

ARTIFICIAL VESICO-VAGINAL FISTULA.

Artificial vesico-vaginal fistula is the term applied to the operation for making a communication between the bladder and the vagina.

Indication.—The only condition which calls for such an operation is severe chronic cystitis, which cannot be cured by any other line of treatment.

Instruments.—A metal catheter; scalpel; toothed dissecting forceps; small curved needles; needle-holder; and a posterior speculum (*v.* Figs. 142, 141, 140, 146, 147).

Operation.—A posterior speculum is introduced into the vagina and the anterior vaginal wall exposed. A metal catheter is passed into the bladder, and pushed against the posterior bladder wall in such a manner as to cause a prominence on the anterior vaginal wall in the middle line. By cutting on to the tip of the catheter, an opening of about three-quarters of an inch in length is made into the bladder. Three or four sutures are then passed through both vaginal and bladder walls just inside the cut edges of the opening, in such a manner that when tied they will bring the vaginal and bladder mucous membranes into contact. By this means, the subsequent closing of the opening is prevented.

After-treatment.—A light plug of gauze is placed in the vagina, one end of which projects slightly through the opening. This plug must be removed in four or five hours, for fear of urinary decomposition. The sutures may be removed in a week.

CYSTOSCOPY.

Cystoscopy (κύστις, the bladder; σκόπεω, I see) is the term applied to the visual examination of the bladder. This most useful procedure can be accomplished by means of Pawlic's cystoscope as modified by Kelly, or by an electric cystoscope, such as Nitze's. By means of these instruments it is also possible to catheterise the ureters, and to draw off the urine separately from each kidney. In this way, most valuable information can be obtained in cases of suspected disease of the kidneys. Nitze's cystoscope is easier to use for this purpose, and seems to us to be in every way preferable to Kelly's.

The interior of the bladder can also be directly examined with

the finger introduced through the urethra, and although this procedure is not cystoscopy, we may briefly refer to it here.

Indications.—The exploration of the bladder with the finger, or the direct examination of its walls by means of a cystoscope, is indicated under the following circumstances :—

(1) In cases of persistent chronic cystitis, with the object of ascertaining the cause for the condition.

(2) In cases of suspected disease of one kidney, with the object of establishing a diagnosis, and of determining which kidney is diseased.

(3) In cases of hæmaturia.

Exploration with the finger is as a rule an objectionable procedure, as it is very easy to over-dilate the sphincter and cause a temporary, or even a very prolonged, incontinence of urine. Moreover, it is seldom necessary.

Instruments.—For the examination of the bladder by means of

FIG. 179.—Kelly's urethral dilator.

Kelly's cystoscope the following instruments and apparatus are required (Kelly) :—

(1) A set of graduated metal dilators made on the principle of Hegar's dilators, and ranging from No. 5 to No. 14 (*v.* Fig. 179). The numbers correspond to the diameter of the instrument in millimetres. A single conical urethral calibrator or dilator (Kelly) may be used instead (*v.* Fig. 180).

(2) A set of vesical specula also ranging in size from No. 5 to No. 20 (*v.* Fig. 180). The sizes up to twelve are used for inspection, those above twelve for operating through.

(3) An alligator forceps for use through the speculum, a long mouse-toothed forceps, an applicator, an ureteral searcher (*v.* Figs. 180, 181), and an evacuator for keeping the bladder empty.

(4) Some form of illuminant, which must be fairly strong and portable. If the necessary current can be obtained, a sixteen candle-power electric lamp is most suitable.

(5) A head mirror as used in laryngoscopy.

For the examination of the bladder with Nitze's cystoscope, the following apparatus is required :—

(1) Nitze's cystoscope. There are two forms of this instrument, one for cystoscopy alone, and the other both for cystoscopy and for ureteral catheterisation. The former instrument is more suitable for cystoscopy, as it gives a larger field of vision, but if the operator only possesses a single instrument, it should be the second form, as it can be used for both purposes (*v.* Fig. 182).

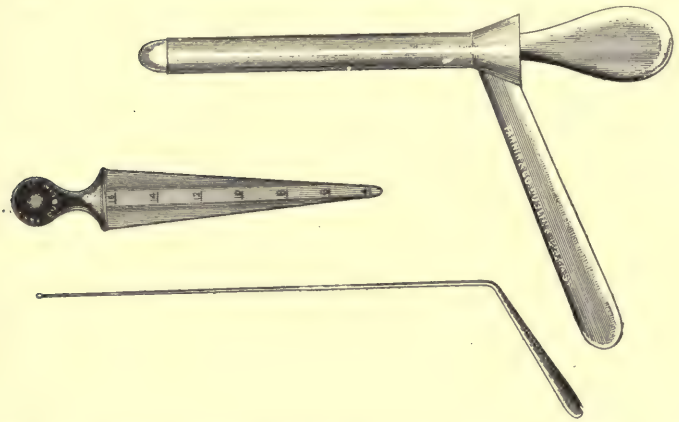


FIG. 180.—Kelly's vesical speculum, conical urethral calibrator, and ureteral searcher.

(2) Ureteral catheters for use with the second form of cystoscope.

(3) A primary battery, or an accumulator, capable of giving an effective current of twelve volts for an hour at a time.

(4) A rheostadt, *i.e.*, a resistance for cutting down the amount of current.

(5) A funnel and rubber tube, and catheter, or other means of introducing fluid into the bladder. Also a measure glass for measuring the amount of fluid introduced.

(6) A black cloth for covering the head when using the cystoscope, and so shutting out extraneous light.

Operation.—The mode of using the two kinds of cystoscope differs materially, and so each will be discussed separately.

Kelly's Cystoscope.—In order to get good results with Kelly's cystoscope, three points require attention :—

(1) There must be a good source of light, capable of being so adjusted that its rays can be thrown through the speculum into the bladder.

(2) The bladder must be distended to the full, or very nearly to the full, by atmospheric pressure.

(3) The bladder must be kept free from urine.

As has been said, a sixteen candle-power incandescent lamp furnishes the most suitable light. The necessary ballooning of the bladder can be obtained by having the intestines empty, by relaxing all abdominal pressure so far as possible, and by placing the patient in such a position that the intestines gravitate towards the diaphragm, so lessening the intra-abdominal pressure on the bladder. For the last purpose there are two suitable positions, the knee-breast position, and the elevated dorsal

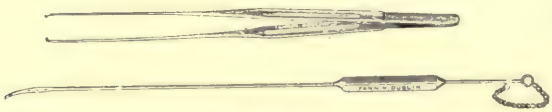


FIG. 181.—Kelly's mouse-toothed forceps for use through the speculum, and an ureteral catheter.

position. The latter is the least tiring for the patient, and is also the position in which an anæsthetic can be most easily given. It is not, however, of much value in stout patients with strong abdominal walls, as it does not furnish a sufficient difference in level to make the intestines fall well down towards the diaphragm. For such cases the knee-breast position is the more suitable. If an anæsthetic is given, "the best way to hold the patient in the knee-breast position is for two assistants to stand, one at each side, close up to the body to prevent it from falling sideways, each grasping the body with one arm thrown over the back, and holding the leg in the crotch of the knee with the other hand to keep it (the leg) from slipping up or down" (Kelly). The urine which collects in the bladder can be removed from time to time by the use of the evacuator, or by means of pledgets of cotton wool introduced by means of the alligator forceps.

To examine the bladder, the patient is placed in whichever position is considered most suitable, and under an anæsthetic if possible. The urethra is then dilated by introducing successive

sizes of the urethral dilators, or by gently introducing the conical dilator until the necessary size is obtained. As a rule dilatation up to No. 12 or 14 will be quite sufficient, and if the dilatation is carried beyond this there is a danger of causing permanent paresis of the sphincter vesicæ, although Kelly uses specula up to No. 20. The speculum corresponding in size to the dilator which has been last used is then introduced, and as soon as the obturator which fills its orifice is removed, air rushes in and the bladder expands. By means of the laryngeal mirror—fixed on the forehead of the examiner, the rays, from whatever source of illumination is used, are thrown down the speculum, and the portion of bladder wall immediately opposite the mouth of the speculum can be clearly seen. By moving the speculum about, the entire interior of the bladder can be thus seen. The orifice of each ureter is seen as a fine transverse line about two millimetres long, situated on the side of a little pinkish prominence—the *mons ureteris*—which marks the site at which the ureter opens into the bladder (Kelly).

If, as frequently happens, a slight laceration of the urethral orifice occurs during examination, it must be closed by a couple of fine silk or catgut sutures.

Nitze's Cystoscope.—The patient should lie in the dorsal position on an ordinary gynæcological couch or table. An anæsthetic is not required, and indeed is not desirable, as the instrument causes little or no pain unless the tip is brought into too close proximity to the bladder wall. If this is done, it causes pain, and the patient, if conscious, will call immediate attention to the fact, and so prevent any serious injury by burning. The first step in the operation is the distension of the bladder with a clear fluid. If the urine is clear it makes a good medium, but if the urine is at all turbid owing to the presence of blood or pus, it must be carefully and gently drawn off, and a clear fluid substituted. The most suitable fluid for the purpose is either sterilised water or boric lotion, introduced at blood heat. If the bladder walls are inclined to bleed, the fluid must be introduced very slowly and gently, otherwise fresh bleeding may be set up, and any attempt at cystoscopy prevented. If there is a deposit of pus in the bladder it must first be washed away, and then clear fluid injected. The amount of fluid injected is of importance. If the bladder is over-distended the fundus is pushed away

so far that it cannot be examined, and, if it is insufficiently distended, the mucous membrane at its base hangs in folds and may hide the orifices of the ureters. It is best to commence by injecting six ounces, and then to examine the fundus and bladder wall generally. From four to six ounces more may then be injected, and the base of the bladder again examined. The cystoscope is introduced into the bladder just as is a catheter, with its lamp switched off. Care must be taken that the point of the ureteral catheter or its guide does not protrude, as, if either of them did so, it would catch the urethral mucous membrane and might cause hæmorrhage, in addition to

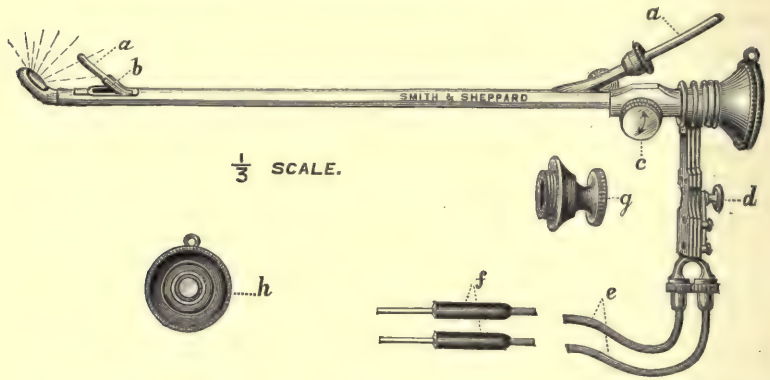


FIG. 182.—Nitze's ureteral and inspection cystoscope. *a*. Ureteral catheter. *b*. Catheter guide. *c*. Screw for moving catheter guide. *d*. Contact breaker. *e*. Battery cords. *f*. Terminals. *g*. Eye-piece cover. *h*. Eye-piece.

causing pain. As soon as the cystoscope is in position, the light is switched on. The orifices of the ureters can be readily found under normal conditions by turning the cystoscope slightly to each side of the middle line, so as to examine the base of the bladder.

If we want to catheterise the ureters, the catheter is gently pushed forwards with the fingers, and guided towards the ureteral orifice by raising or lowering the catheter guide with the screw as is seen to be necessary. Once the point engages in the orifice, its further introduction is easy.

Care must be taken not to keep the beak of the instrument in contact with the bladder wall. A momentary application is of no consequence, but a prolonged application may cause serious burns.

When the examination is finished, the catheter is removed, the guide carefully turned down into its place, the light switched off, and the instrument gently withdrawn. Throughout the whole procedure the light should be switched off whenever it is not required, in order to prevent the overheating of the instrument.

The sterilisation of the cystoscope and of the catheters must be carefully carried out before and after use. The catheters can be sterilised best by means of vapourised formalin in the steriliser shown in Fig. 123. The cystoscope can be sterilised in the same manner, or by prolonged immersion in a five to ten per cent. solution of formalin. After sterilisation, it is removed and carefully washed free of formalin and dried. It is well occasionally to put a little vaseline on the screws to prevent corrosion.

Our own experience of the two forms of cystoscope is that, while Kelly's instrument is well suited for examining the fundus of the bladder, Nitze's is more suitable and more easily used for examining the base of the bladder and the ureteral orifices. Its use does not cause any pain, and does not necessitate the administration of an anæsthetic, as is often the case with Kelly's instrument. Moreover, dilatation of the sphincter is unnecessary, and any risk of subsequent trouble from such a procedure is avoided.

After-treatment.—No special after-treatment is necessary. The patient should remain quietly in bed for a day or two. If the sphincter has been dilated, there may be slight urinary incontinence lasting for twenty-four or forty-eight hours, but it will soon pass off if the degree of dilatation has not been too great. If any sutures have been inserted, they may be removed on the fifth day.

CHAPTER XIX.

OPERATIONS ON THE VULVA, PERINÆUM, AND VAGINA.

Operations on the Vulva: Amputation of the Clitoris—Removal of Bartholin's Gland: Solid Tumours of the Labium: Imperforate Hymen—Operation for Relief of Pruritus Vulvæ. Operations on the Perinæum and Vagina: Perinæorrhaphy and Colpo-perinæorrhaphy—Incomplete Perinæorrhaphy and Colpo-perinæorrhaphy; Lawson Tait's, Modification of Lawson Tait's, Martin's, Kelly's, Hegar's—Complete Perinæorrhaphy and Colpo-perinæorrhaphy; Lawson Tait's, Hegar's: Anterior Colporrhaphy: Removal of Solid Vaginal Tumours: Removal of Vaginal Cysts: Atresia of the Vagina. Colpocleisis.

AMPUTATION OF THE CLITORIS.

Amputation of the clitoris is indicated in—

(1) Malignant disease.

(2) Elephantiasis.

Instruments.—A scalpel; half a dozen clip-forceps; a toothed dissecting forceps; scissors with sharp points; small and medium whole-curve needles; and a needle-holder (*v.* Figs. 142, 141, 140).

Operation.—The diseased area is marked out by means of an incision through the skin. If the case is one of malignant disease, the incision must be so made as to include the entire affected area, and if subsequently the skin edges cannot be brought together, the uncovered area must be grafted or left to granulate. The growth is then seized in the forceps, pulled outwards, and detached from its base either by tearing through the soft tissue with the handle of the scalpel, or by dividing it with the scissors. In malignant disease this dissection must be carried right down to the pubic bones, the periosteum of which must also be removed. As a rule the lower part of the urethra is involved in the growth, and must be dissected out and removed. Any large vessels which are cut must be tied or twisted in an artery forceps; as a rule, however, all bleeding will cease as soon as the sutures are tied. These are passed from left to right beneath the base of the wound, and they should

draw the skin into contact with the skin on the opposite side, or with the vaginal mucous membrane. Intermediate superficial sutures, which include the skin only, must also be inserted as well. Silkworm-gut is the best material for all the sutures. If, owing to the very extensive nature of the growth, it is found to be impossible to bring the edges together, it may be necessary to leave the wound to granulate. In such a case, if there is excessive oozing from the raw surface, it may be checked by touching the surface gently with a Paquelin's cautery at a dull red heat. In this operation and in similar operations, the amount of hæmorrhage may be very much lessened by injecting subcutaneously in several places round the growth, prior to the operation, a couple of minims of a 1 in 3,000 solution of adrenalin. The solution may be also applied during the operation to the cut surfaces with a sponge of cotton wool. In malignant disease, the inguinal glands should be removed as a routine practice.

After-treatment.—The wound is powdered with boracic acid and covered with a sterilised dressing and T bandage. The dressing must be removed whenever it is soiled, and when the patient passes water, and additional powder and a new dressing applied. The sutures may be removed on the eighth day.

REMOVAL OF BARTHOLIN'S GLAND.

The removal of Bartholin's gland is indicated—

(1) If it becomes cystic.

(2) If an abscess forms which is not cured by incision and drainage.

Instruments.—The instruments required are the same as those used for amputation of the clitoris (*v.* page 344).

Operation.—An incision is made through the skin over the most prominent part of the cyst, and parallel to the labium. With the handle of the scalpel the cyst is then detached from the surrounding tissue, if possible without rupturing it. As soon as its margins have been freed all round, it can be drawn outwards by seizing it in the fingers or in a dissecting forceps. Its attachments at the base are thus exposed, and form a kind of pedicle. This pedicle is ligated and divided, and the cyst removed. The cavity left by its removal is closed—if not too large—by silkworm-gut sutures, passed transversely, and going

completely below its base. If it is of considerable size, it must be closed by successive layers of buried catgut sutures.

If we have to deal with an abscess and not with a cyst, it is sometimes best to scrape out the gland with a sharp curette, instead of dissecting it out, and then to plug the resultant cavity with iodoform gauze. This gauze is removed and fresh gauze introduced daily, or every second day, until the cavity is obliterated If sutures are used, they may be removed on the eighth day.

REMOVAL OF SOLID TUMOURS OF THE LABIUM.

Solid tumours of the labium, if pedunculated, are very easily removed. Sessile tumours must be excised in whatever way will leave the least deformity, and enable the edges of the skin to be brought together by sutures so as completely to close the wound.

INCISION OF IMPERFORATE HYMEN.

The operation for the cure of an imperforate hymen is of extreme simplicity. It is, however, not always free from danger, on account of the liability of the retained menstrual products to decompose when air gains access to them.

Operation.—As a rule, the operation must be done in two stages. The first stage consists in making a small opening with a scalpel through the obstructing membrane sufficiently large to allow the fluid to escape. This opening is carefully covered with a large pad of antiseptic cotton wool, in order that all discharge may be absorbed as it comes away. The cotton wool is changed, and the patient carefully washed, every few hours. As soon as all the discharge has escaped, the opening in the hymen is enlarged by a crucial incision; and the vagina and uterus—if the latter has shared in the dilatation—are douched out thoroughly, and plugged with iodoform gauze. This plug is removed in twenty-four hours.

OPERATION FOR THE RELIEF OF PRURITUS VULVÆ.

The following procedure was devised by C. B. Ball for the relief of pruritus ani, and as he found it successful in this condition he

subsequently adopted it, and with equal success, in the case of pruritus vulvæ. It is very simple, and is well worth a trial in cases in which pruritus does not respond to non-operative measures.

Indications.—The operation is indicated in cases of pruritus vulvæ, the result of lesions of the sensory nerves of the affected area.

Instruments.—The following instruments are required:—A scalpel; scissors curved on the flat; a dozen clip forceps; suture materials, dissecting forceps, needles, and needle-holder (*v.* Figs. 142, 141, 140).

Operation.—The patient is placed in the dorsal gynæcological position, and the skin round the vulva, the vulva, and the vagina disinfected in the usual manner. The limits of the affected area are then mapped out, and an elliptical incision made at each side so as to enclose this area between them. As a rule these incisions stop just short of the anterior fourchette in front, and posteriorly stop at each side of the perinæum, but their exact position varies in different cases. The incisions are carried completely through the skin. Flaps are then raised by careful dissection with scissors, keeping as close to the skin as possible. The dissection is carried inwards as far as the junction of skin and vaginal mucous membrane. If the perinæum is included in the affected area, its skin is undercut between the posterior ends of the two incisions. If the area of affected skin is more limited in extent, a similar procedure is adopted, so far as the affected area is concerned.

All bleeding is then carefully stopped by tying any vessels which have been divided, and the flaps are replaced, and maintained in position by sutures.

The effect of the operation is to separate the nerves from the nerve endings in the skin, and so to render the part temporarily anæsthetic. Subsequently sensation returns, but Ball's experience has shown that the pruritus does not return.

After-treatment.—The after-treatment is similar to that of perinæorrhaphy (*v.* page 367).

PERINÆORRHAPHY AND COLPO-PERINÆORRHAPHY.

By the term perinæorrhaphy (*περίναιον*, the surrounding district; *ῥαφή*, a seam) is meant the suturing of a ruptured perinæum with the object of restoring it to its original condition.

By the term colpo-perinæorrhaphy (κόλπος, the vagina; περίναιον; ῥαφή, a seam) is meant the narrowing of the vagina by the removal of a portion of the mucous membrane of the posterior vaginal wall, and at the same time the re-forming of the perinæum.

Indications.—Immediate perinæorrhaphy is indicated in all cases in which the so-called inevitable laceration of labour involving the posterior fourchette, passes that limit and invades the perinæum proper.

Perinæorrhaphy for chronic laceration is indicated under the following conditions :—

(1) If the laceration extends into the rectum, that is if it is "complete."

(2) If the laceration tends to cause gaping of the vulva,

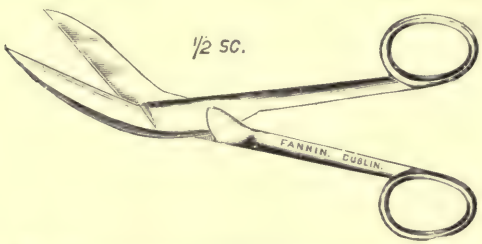


FIG. 183.—Lawson Tait's perinæorrhaphy scissors.

or to favour prolapse of the vaginal walls or uterus.

(3) If the laceration prevents the retention of a suitably sized pessary, in cases where such must be worn.

Colpo-perinæorrhaphy is indicated instead of perinæorrhaphy under any of the foregoing conditions, when, in addition to laceration of the perinæum, there is prolapse of the posterior vaginal wall.

Instruments.—A pair of sharp-pointed scissors with the blades inclined laterally at an angle of a right angle and a half to the handles (*v.* Fig. 183); three or four pairs of American forceps; two or three clip forceps; large and medium whole-curved needles; a needle-holder; a right-handled and blunt pedicle needle; silkworm-gut and catgut sutures; and a toothed dissecting forceps (*v.* Figs. 9, 141, 140, 148, 142).

Operations.—The operations for the repair of the perinæum, either with or without an accompanying rectocele, fall into two

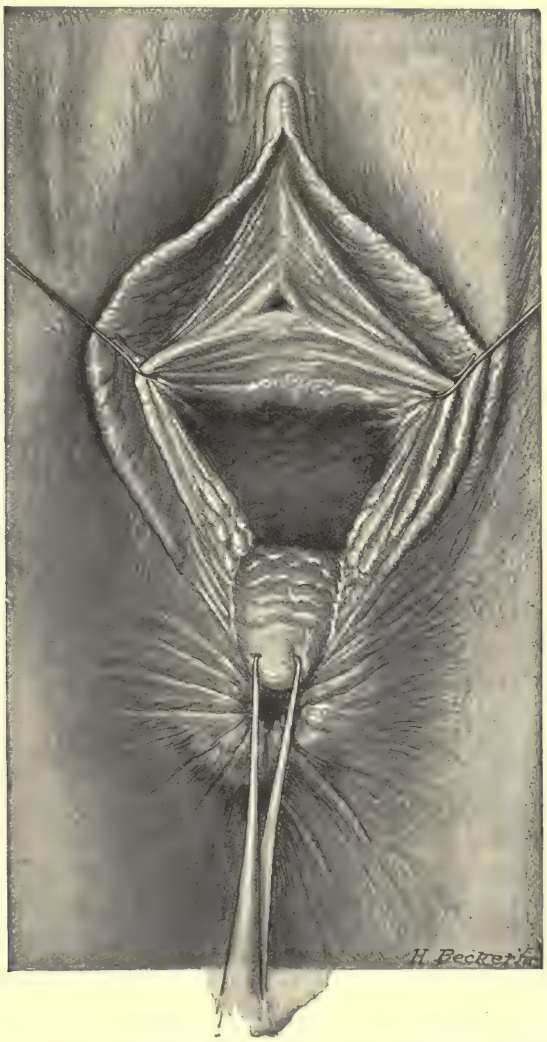


FIG. 184.—Chronic incomplete laceration of the perinæum. (*Kelly.*)

groups according as the perinæal laceration is incomplete or complete.

I. Incomplete perinæorrhaphy and colpo-perinæorrhaphy.

II. Complete perinæorrhaphy and colpo-perinæorrhaphy.

I. Incomplete Perinæorrhaphy and Colpo-perinæorrhaphy.—Under this heading we shall describe two operations for the cure of perinæal laceration alone, and three operations for the repair of perinæal laceration accompanied by a rectocele.

(a) **Lawson Tait's Incomplete Perinæorrhaphy.**—The characteristic feature of this method of repairing perinæal lacerations is that no tissue is removed. It is performed as follows:—

Separate the labia and look for the outlines of the laceration. These outlines, which show the extent of repair necessary, will as a rule be found to enclose a crescentic area of cicatricial tissue, whose horns point forwards and end in the lateral portions of the remains of the hymen at the junction of skin and mucous membrane (*v.* Fig. 185, A, B, C). At each of the points A and B the skin is seized in an American forceps, so marking out the anterior limits of the new perinæum. A third forceps is applied to the perinæal skin in the middle line just behind the posterior limits of the tear. The two anterior forceps are held apart by an assistant, the third is allowed to hang down, and by its weight keeps the skin tense. The point of the scissors is now passed firmly through the skin just in front of the posterior forceps, *i.e.* at the junction of what was once the raw surface of the laceration and the perinæal skin, and pushed upwards through the subjacent tissues for about half an inch, keeping parallel to the rectum. The points of the scissors are then turned outwards in the direction of the forceps on the operator's right side, and pushed on until they are just behind that forceps. Then, by closing the scissors the parts are divided at a single cut up to the forceps, care being taken that the skin is incised exactly along the lower margin of the crescentic area mentioned above (Fig. 185, C, B). The scissors are then turned to the opposite side, and a similar incision made there (Fig. 185, C, A). If the case is one suitable for Lawson Tait's operation, *i.e.* if there is no great tendency to the formation of a rectocele but rather a lack of mucous membrane, the vaginal wall will retract upwards and a raw surface be left which more or less corresponds with the original outlines of the laceration (*v.* Fig. 186, A, C′, B, C). The lower portion of the vaginal mucous membrane is then caught at C′ in a forceps and drawn gently forwards, in such a manner that, when the sutures are inserted and tied, it will be situated at the anterior edge of the

new perinæum. If the incisions were not made of sufficient depth in the first instance to permit this to be done, their depth may be increased with the scissors.

The next step consists in the insertion of the sutures. They are passed from side to side, beginning with the most posterior, and in such a manner that, while they take a firm hold of the lateral portions of the raw surface, they only include a small

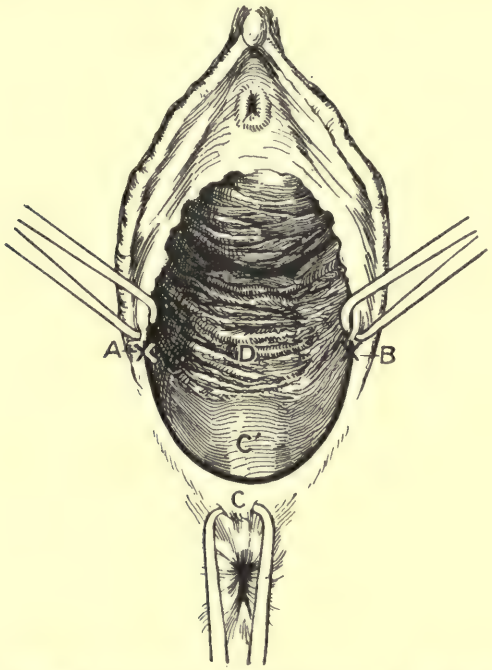


FIG. 185.—Lawson Tait's incomplete perinæorrhaphy. The area A, B, C′ represents the crescentic area of the original laceration. D. The normal vaginal mucous membrane. The heavy line marks the incision.

portion of the base. The most posterior suture is passed first, using a medium-sized needle. It enters the skin slightly to one side of the middle line, passes into the thickness of the external sphincter, if the laceration involves the latter, and emerges at the corresponding point at the opposite side. The next suture is inserted half an inch further forwards, passes deeply into the lateral portion of the wound, includes a little of the base, again passes deeply into the opposite lateral surface, and so out. The third, which is usually the last suture, is inserted another half-inch

further forwards, takes a firm hold of the sides, and travels lightly through the flap so as to keep it in the desired position. By this means, no raw surface is left and the wound heals rapidly. The accompanying drawing shows better than words the manner in which the sutures are passed (*v.* Fig. 187).

This method of dealing with the vaginal flap is not identical with the method described by Lawson Tait. He does not draw

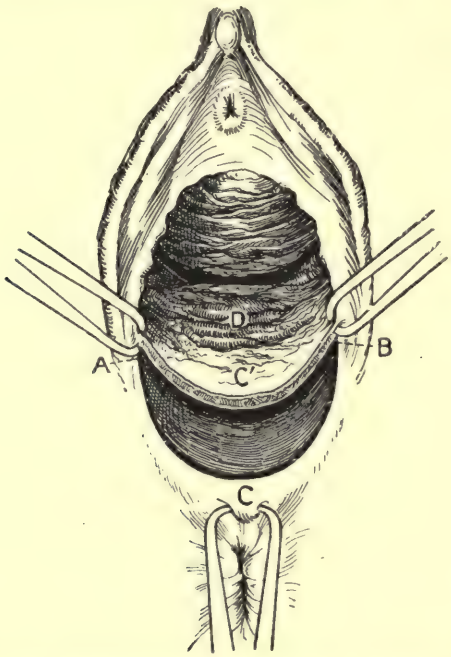


FIG. 186.—Lawson Tait's incomplete perinæorrhaphy. The result of the incision. The posterior vaginal wall has retracted upwards leaving a crescentic denuded area, A, C', B, C, almost similar in size and shape to the cicatricial area, A, B, C'.

the flap forwards, as recommended above, but rather allows it to remain in the position into which it retracts of its own accord. The sutures are entered just within the skin edge and do not include the flap (*v.* Fig. 188, A). It seems as if this method would result in the formation of a long skin perinæum, above which there would be a regular pocket, while the other mode of suturing by drawing the flap forwards restores the original outline of the posterior vaginal wall.

(B) **A Modification of Lawson Tait's Operation.**—For the past few years we have been in the habit of performing the following modification of Lawson Tait's operation, with the object of more surely bringing together the torn edges of the levator ani muscle. If with a finger in the vagina and the thumb on the skin edge of the perinæum, we grasp the tissues lying between the two, we can

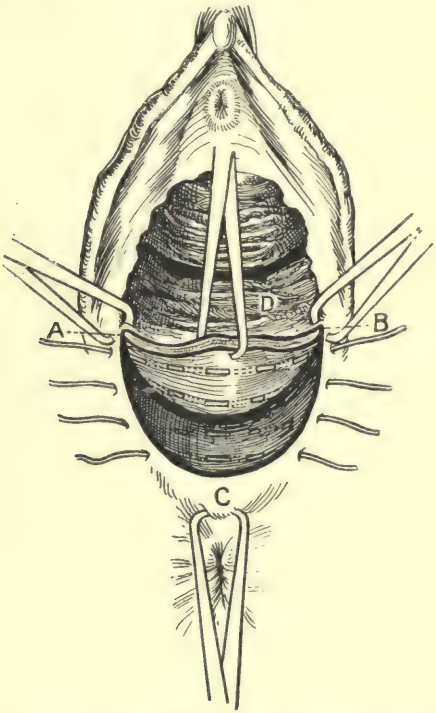


FIG. 187.—Lawson Tait's incomplete perinæorrhaphy. The posterior vaginal wall is drawn forwards by a forceps, and the sutures are *in situ*.

feel at each side a thick band of muscle running from the lower part of the rectum towards the descending ramus of the pubic bone. These two bands of muscle are close together posteriorly, and as they pass forwards they separate. They represent the lateral portions of the levator ani muscle. Before the occurrence of a laceration, these muscles united in the middle line in the depth of the perinæum, and by their forward pull on the lower part of the vagina effectively closed the latter. Accordingly, when repairing the laceration, one of our first objects should be

again to bring together these muscle bands in the middle of the reconstituted perinæum. This object we effect in the following manner:—The usual incisions are first made, as has been described, and the wound is deepened to the required extent. The muscle band on the left side is then caught in a toothed forceps and drawn downwards and towards the middle line. If there is scar tissue round it, it is separated from such tissue by a little dissection. A blunt pedicle needle, threaded with thick

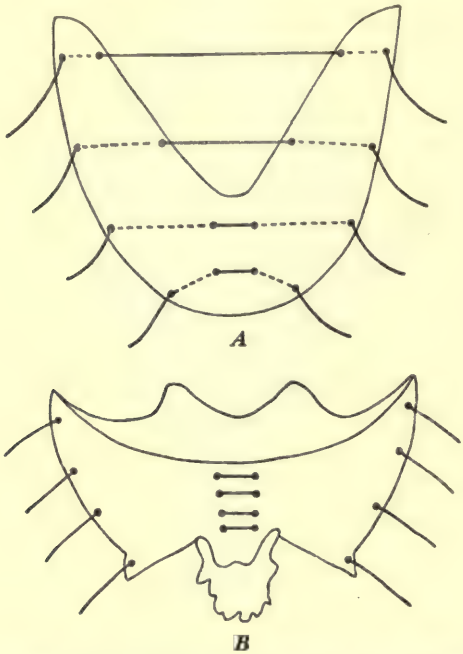


FIG. 188.—A. Lawson Tait's method of inserting the sutures in incomplete perinæorrhaphy. B. Lawson Tait's method of inserting the sutures in complete perinæorrhaphy. (*McKay.*)

catgut, is entered a little above the skin edge on the left side, passed deeply upwards, so as to surround a considerable portion of the muscle, and brought out again slightly to the same side of the middle line, bringing with it the end of the suture (*v.* Fig. 189). The latter is held firmly and the needle is withdrawn. The needle, again threaded with this end of the suture, is entered in the depth of the wound slightly to the right side of the middle line, is passed deeply through the muscle band at this side, and is brought out a little above the skin

edge, at a point corresponding to its point of entrance at the left side. When this suture is tied, it draws the two bands together in the middle line. From two to four such sutures are

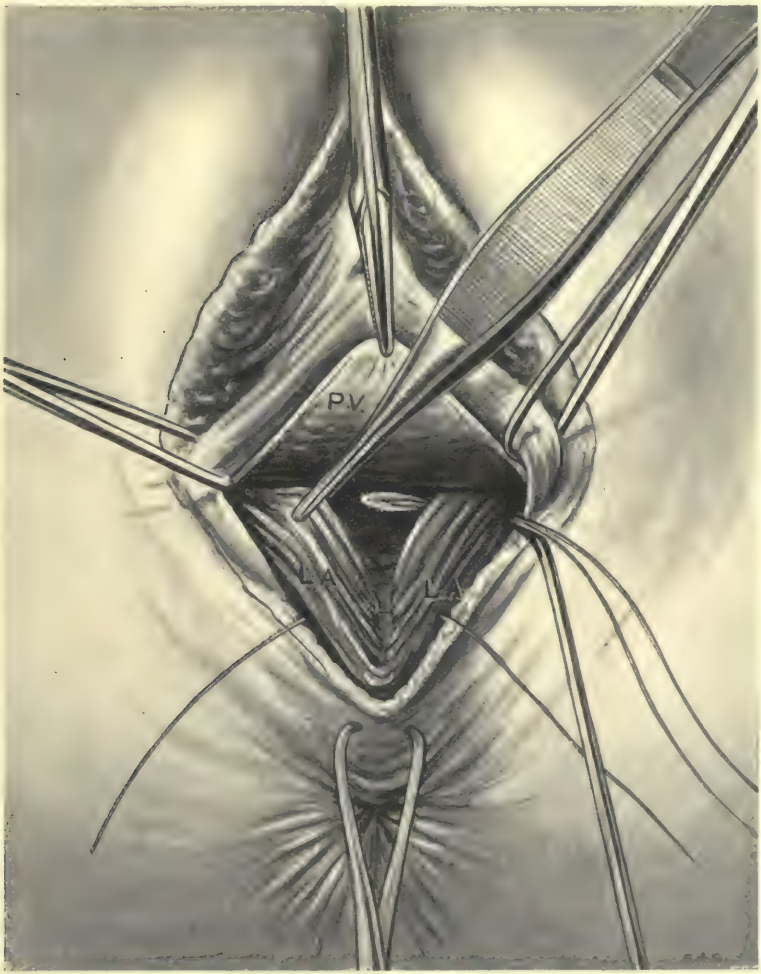


FIG. 189.—Incomplete perinæorrhaphy with suture of the levator ani muscle. Introducing the sutures into the muscle. L.A. Levator ani. P.V. Posterior vaginal flap.

introduced, the most posterior being passed first. When they are tied, the deeper portions of the wound will have been brought together, and the remaining step of the operation consists in

uniting the skin edges with more superficial sutures of silkworm gut (*v.* Fig. 190).

The result of this procedure is most satisfactory, as it gives a practically perfect restoration of the muscular structures of the pelvic floor.

If there is much redundant skin, but yet not sufficient to warrant the performance of a colpo-perinæorrhaphy, the following slight difference is made in our procedure. After the incision

FIG. 190.—Incomplete perinæorrhaphy with suture of the levator ani. The superficial sutures in position.

has been made, as described above, the depth of the wound is increased by pushing the finger upwards in the recto-vaginal fossa so as to peel the vaginal flap off the rectum. The vaginal flap is then drawn downwards, and as much of it as is considered necessary is cut off. In doing this, care must be taken not to remove more than will allow the anterior edge of the flap to be subsequently drawn forwards to form the anterior edge of the perinæum, and to preserve its original outline.

We may now briefly sum up the steps of the operation which we consider best when simple perinæorrhaphy is required:—

(1) Apply American forceps in the manner we have indicated, and make an incision along the junction of skin and mucous membrane as directed by Lawson Tait.

(2) Deepen this incision as is found necessary, catch the

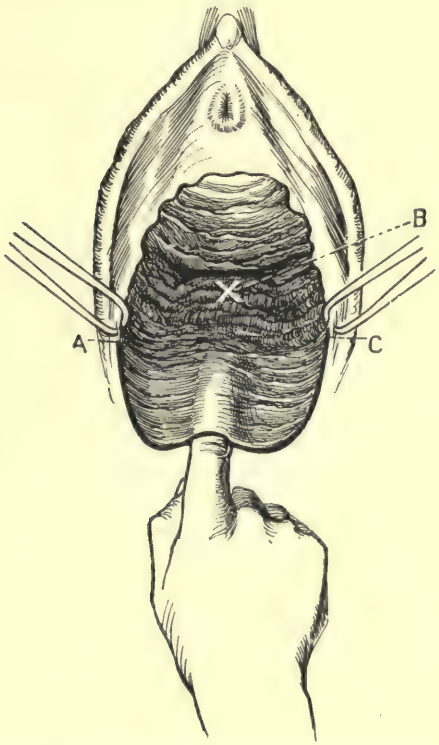


FIG. 191.—Hegar's incomplete colpo-perinæorrhaphy. A, C. The initial incision at the junction of the skin and mucous membrane. The finger is detaching a vaginal flap. B. Cross marking the apex of the triangle which is to be detached.

levator ani muscle on each side with forceps, expose its fibres by dissection, and tie any large vessels which are bleeding.

(3) Pass and tie deep catgut sutures through the lateral bands of the muscle, introducing them successively from behind forwards.

(4) Pass and tie superficial sutures of silkworm gut to bring together the skin edges and the edges of the vaginal flap, which has been previously trimmed to the proper size. These sutures

may also include a portion of the muscle so as to act as reinforcing sutures to the catgut sutures.

(c) **Hegar's Incomplete Colpo-perinæorrhaphy.**—Hegar's operation consists in the removal of a triangular portion of mucous membrane from the posterior vaginal wall. The base of this triangle corresponds with the junction of the mucous membrane covering the old laceration and the perinæal skin. The apex is

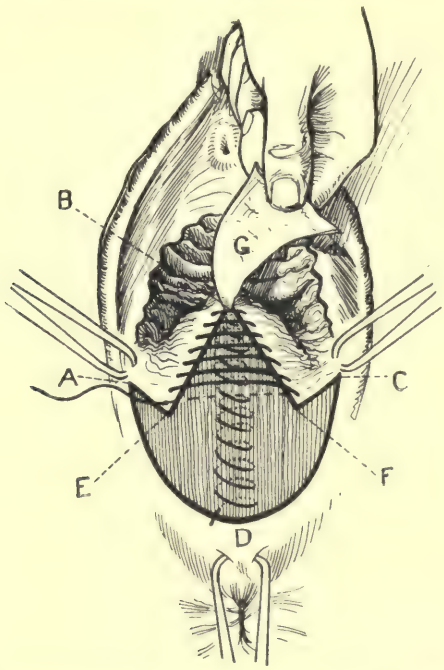


FIG. 192.—Hegar's incomplete colpo-perinæorrhaphy. The flap G of mucous membrane has been detached and is drawn upwards by an assistant. The deep catgut sutures have been inserted, and also the superficial sutures as far as that point at which they cease to include the submucous tissue. (The superficial sutures are shown slack in order to expose the buried sutures beneath.)

situated on the posterior vaginal wall, in the middle line and from two to three and a half inches from the perinæum, according to the case. The author prefers the following slight modification of the original operation, as it can be performed in a shorter time and with less assistance.

Commence the operation as if it was intended to perform Lawson Tait's perinæorrhaphy, by placing two American forceps at the

extremities of the cicatricial crescent, and one in the middle line just behind the junction of skin and mucous membrane (*v.* Fig. 185). With a sharp-pointed scissors an incision is made round the posterior wall from one bullet forceps to the other, at the junction of skin and mucous membrane. It is similar to that made in Tait's operation, save that it is not carried so deeply into the perinæal body, but rather keeps as close as possible to the

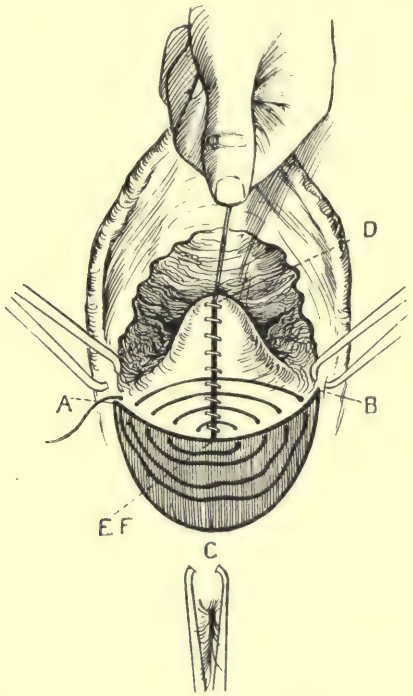


FIG. 193.—Hegar's incomplete colpo-perinæorrhaphy. The sutures in the upper part of the vagina have been drawn tight, and the sutures in the lower part—which only include the vaginal mucous membrane—are in position.

vaginal mucous membrane. The vaginal flap so commenced is separated from the rectum by pushing the latter backwards with the finger, and this separation is continued until a piece of mucous membrane, which forms a triangle with concave sides, is subcutaneously detached (*v.* Fig. 191). This flap, G, is then freed from its lateral vaginal attachments with scissors, and only remains connected to the vagina by a narrow strip of mucous membrane about a quarter of an inch wide at the very apex

(*v.* Fig. 192). The object of allowing the flap to remain attached at the apex is that by pulling upon it the upper portion of the wound can be drawn down, and so the application of an American forceps rendered unnecessary.

The wound is sutured as follows :—The operator commences below, just inside the perinæal skin, and works upwards with a small needle, threaded with catgut, towards the upper angle, which is exposed by pulling down the flap. The sutures are

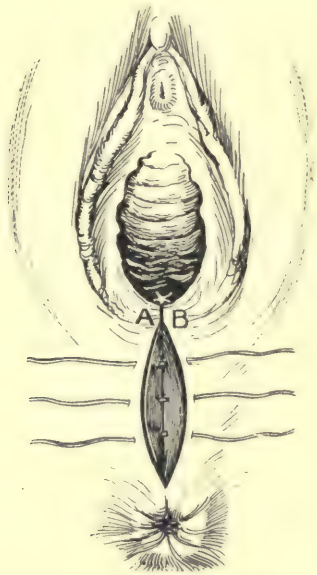


FIG. 194.—Hegar's incomplete colpo-perinæorrhaphy. The vaginal sutures are tied, and the perinæal sutures have been inserted. (These sutures are passed more deeply than is shown in the figure.)

passed from side to side, and in such a manner as to approximate the central two-fourths of the raw area (*v.* Fig. 192). Care must be taken not to pass the sutures too deeply, as there is not a great depth of tissue in front of the rectum. As soon as the upper angle, B, of the wound is reached, the suture is passed so as to include the mucous membrane as well as the submucous tissue; and, when the first suture has been passed in this manner, the flap of vaginal mucous membrane may be removed by snipping across the remaining strip. The suturing is then continued from above downwards, and the sutures are passed in

such a manner as to include the edges of the vaginal mucous membrane as well as the remaining portion of the base of the wound. As soon as a point is reached on the vaginal wall about an inch above the skin perinæum—that is to say a point, E and F, which, approximately, corresponds with the upper limit of the old perinæal laceration, the sutures are passed so as to include the vaginal mucous membrane alone (*v.* Figs. 192 and 193). In this way we avoid compressing the perinæal body from before backwards, and reconstitute the original outline of the posterior vaginal wall. The next step consists in bringing together with buried catgut sutures the lateral bands of the levator ani muscle exactly as has been described under the head of simple perinæorrhaphy. These sutures are then tied from behind forwards. The last step consists in passing silkworm-gut sutures from the skin surface of the perinæum, with a medium needle, in such a manner as to bring together laterally those portions of the wound which have not been included in the continuous or in the buried sutures (*v.* Fig. 194).

We usually perform the foregoing modification of Hegar's operation in cases requiring a colpo-perinæorrhaphy, and it is, we think, both the easiest to perform and the most satisfactory in its after-results.

II. Complete Perinæorrhaphy and Colpo-perinæorrhaphy.—Two operations are in common use for the repair of a complete laceration of the perinæum. In the first, Lawson Tait's, no tissue is removed; while in the second a triangle of vaginal mucous membrane is taken away as in Hegar's incomplete colpo-perinæorrhaphy.

(A) **Lawson Tait's Complete Perinæorrhaphy.**—Lawson Tait's operation for complete laceration of the perinæum is performed as follows:—The skin is seized in an American forceps at the anterior limits of the outline of the original laceration, one at each side, and two additional forceps are applied, also one at each side, just outside the junction of the vagina and the anus (*v.* Fig. 195). An assistant at each side holds one anterior forceps and one posterior forceps, and draws them outwards in such a manner as to place the recto-vaginal septum on the stretch. The scissors are then entered at the point F (*v.* Fig. 195), and passed upwards for about half an inch between the rectal and vaginal mucous

membrane, and an incision is made from F to E in such a manner as to split the septum. From the ends of this incision two other incisions are made extending forwards, from E to A and from F to B respectively, along the lower outline of the original tear, as is done in the case of incomplete rupture. Finally, two incisions, one at each side, are made from the same points, F and E, backwards and outwards at each side of the rectum as far as the points

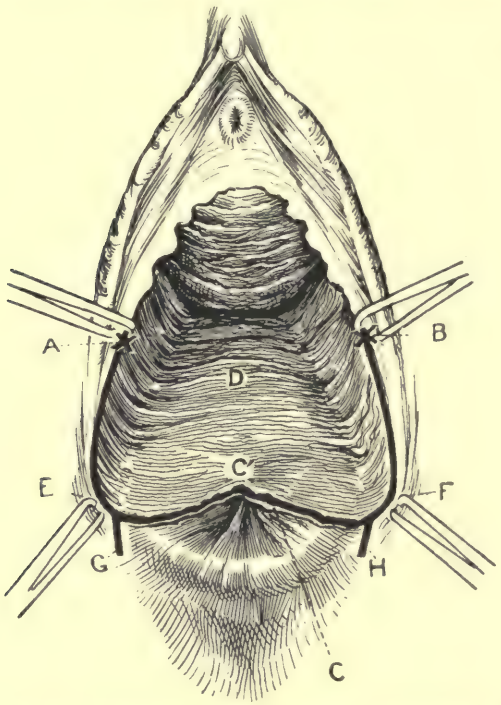


FIG. 195.—Lawson Tait's complete perinæorrhaphy. The area A, E, C', F, B, D, shows the area of the original laceration. The heavy lines mark the incisions.

G and H. By a little dissecting, the vaginal mucous membrane is freed from the rectal wall, so as to permit of the former being drawn downwards and forwards, and the latter downwards and backwards, while at the same time the retracted ends of the divided sphincter muscle are exposed (*c*. Fig. 196). The sutures are then passed transversely from behind forwards, as shown in the diagram, in a similar manner to that which has been described. The posterior suture must be passed deeply into the retracted

ends of the sphincter, in such a manner as to bring them together when it is tied. The sutures are tied from behind forwards, and bring together successively in the middle line the cut edges C G and C H, and G E A and H F B. The posterior flap which was drawn backwards helps to make up the loss of tissue in the anterior rectal wall, and, similarly, the anterior flap which was drawn forwards to make up the deficiency in the posterior vaginal wall. In the foregoing description we have again departed

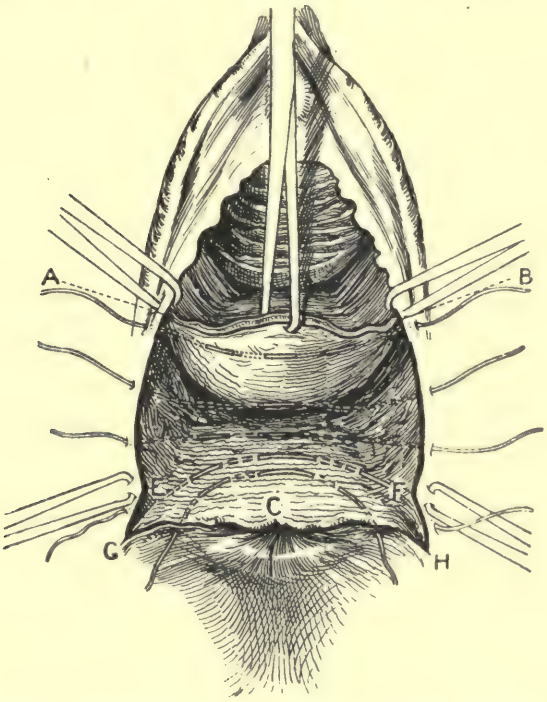


FIG. 196.—Lawson Tait's complete perinæorrhaphy. The recto-vaginal septum has been split, and the posterior vaginal wall drawn forwards by the forceps inserted at C'. The sutures are shown in position.

from the original method of suturing as recommended by Lawson Tait. The latter will be understood by reference to the diagram (*v.* Fig. 188, B).

(B) **Hegar's Complete Colpo-perinæorrhaphy.**—This operation is a most suitable and satisfactory one for all cases of complete laceration of the perinæum, and is probably better than Lawson Tait's operation in cases in which the rectal laceration is of

considerable extent. In the following description, we are departing slightly from the original method of performing the operation, particularly in the method of suturing.

Four bullet forceps are applied as in Lawson Tait's operation, and with a fifth the posterior vaginal wall is seized in the middle line half an inch above the apex of the rectal tear. The edge of the recto-vaginal septum is then split with scissors as in Lawson Tait's operation, and the ends of the incision carried forward to the forceps at the anterior horns of the perinæal lacera-

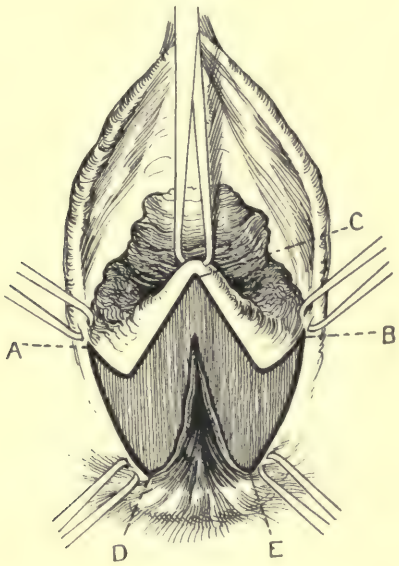


FIG. 197.—Hegar's complete colpo-perinæorrhaphy. A, C, B, E, D. The denuded area.

tion (*v.* Fig. 195). This incision forms the base of the triangle of mucous membrane which is to be removed. The sides are then defined with the scalpel by two incisions which run from a point just below the bullet forceps on the posterior wall to the anterior ends of the first incision. The area of mucous membrane thus marked out is removed, and in this way a raw surface is obtained similar to that in Hegar's incomplete operation, save for the presence of the gap between the vagina and rectum (*v.* Fig. 197). A continuous catgut suture is then commenced at the apex of the rectal tear, and carried down to

the anus in such a manner as to bring the edges of the tear into accurate apposition. Each stitch should take up a piece of the torn rectal wall, but should not pass through the rectal mucous membrane (*v.* Fig. 198). The perinæal laceration has now been turned from a complete to an incomplete laceration, and the remainder of the suturing is performed in a manner identical to that which has been already described in the case of Hegar's incomplete operation. First, the continuous catgut suture is knotted as soon as the anal end of the rectal tear is reached, in

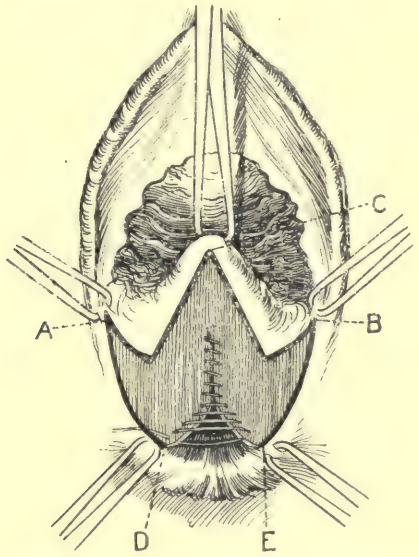


FIG. 198.—Hegar's complete perinæorrhaphy. Suturing of the tear in the rectal wall.

order to prevent any risk of the tension of the stitches relaxing. The suture is then continued upwards to the apex of the denuded triangle, in such a manner as to approximate the centre two-fourths of the raw area. The suture is then continued again downwards, and this time takes in the vaginal mucous membrane (*v.* Fig. 199). At the upper half of the wound, the base is included in each stitch, but, at the lower half, the vaginal mucous membrane alone is traversed by the sutures. The levator ani muscles are then brought together with buried sutures of thick catgut, as has been already described (*v.* page 354). Finally from three to four silkworm-gut sutures are passed from the

perinæal skin as shown in Fig. 194, in order to bring together the lateral edges. Care must be taken that the posterior suture passes deeply into the external sphincter and brings its divided edges together, so far as possible.

Complications.—The only special complication which need be feared is the wounding of the rectum either with the scissors or needle, and the subsequent formation of a recto-vaginal fistula. Wounding with the scissors is most unlikely to occur.

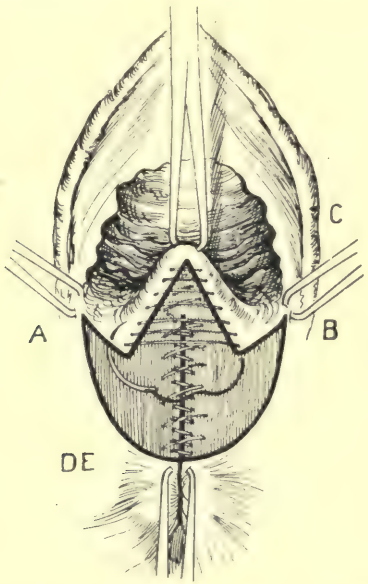


FIG. 199.—Hegar's complete colpo-perinæorrhaphy. The tear in the rectal wall sutured and the deep catgut sutures inserted, and also the superficial sutures down to the point at which they cease to include the submucous tissue.

And, if care is taken always to pass the perinæal sutures parallel to the rectum, and perpendicular to the skin surface, and never to direct them backwards, it is usually unnecessary to pass the finger into the rectum as a guide, although, if there is any doubt as to the exact situation of the latter, this precaution should be taken. If such a precaution is adopted, the operator should change the glove on the infected hand, as soon as he withdraws his finger from the rectum. Even if a suture does accidentally pass into the rectum, the danger of a fistula resulting is very slight, but such an occurrence imports another danger into the case, *i.e.* the risk of infecting the wound.

After-treatment.—A light plug of iodoform gauze is placed in the vagina, and the end allowed to project and hang over the wound. Boric powder is freely dusted over the latter, which is then covered with a sterilised dressing and a T bandage. This dressing must be changed whenever the bladder is emptied. The external parts are carefully washed night and morning, and kept as dry as possible. It is well to pass a catheter every eight hours for the first two or three days after operation, in order to prevent urine from trickling down on the wound. If there is any putrefactive or purulent discharge the vagina should be douched, otherwise it is unnecessary to do so. Silkworm-gut sutures should be removed on the eighth day; the catgut sutures are absorbed. The patient is allowed to sit up in bed on the twelfth to the sixteenth day, according to the amount of tissue which has been removed and the consequent strain upon the sutures, and to leave her bed a day or two later. In order to avoid any risk of the accumulation of hard fæces in the bowel, it is well to give a purgative on the evening of the second or third day after the operation in cases of incomplete perinæorrhaphy, and to administer an enema of olive oil just before the bowels act. For the same reason, the bowels must be emptied by purgatives and enemata before the operation, in order to remove any hard masses that may be present.

ANTERIOR COLPORRHAPHY.

By the term anterior colporrhaphy (κόλπος, a vagina; ῥαφή, a seam) is meant the narrowing of the vagina by the removal of a portion of the mucous membrane of the anterior vaginal wall.

Indications.—Anterior colporrhaphy is indicated in cases of cystocele in which the use of a pessary is either undesirable or valueless.

Instruments.—Similar instruments are required as for perinæorrhaphy (*v.* page 348).

Operation.—The cervix is drawn downwards as far as possible, by means of an American forceps fixed on its anterior lip. The mucous membrane just below the urethra is seized in a second forceps applied in the middle line in such a manner that by traction in opposite directions on both forceps the anterior vaginal wall can be made tense. If necessary, this tension can be increased by two forceps inserted laterally as

shown, and so far distant from one another that their easy approximation is just possible. An incision, surrounding an oval piece of mucous membrane, is then made with a scalpel (*v.* Fig. 200). The latter is peeled off, and the edges of the wound brought together with a continuous catgut suture. Care must be taken, when making the initial incision, to go through the entire thickness of the mucous membrane, as otherwise its complete removal is much more troublesome. If there is considerable tension on the sutures, it is well to supplement and

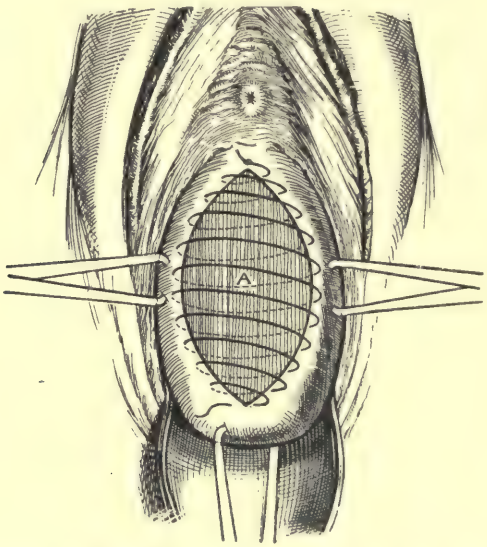


FIG. 200.—Anterior colporrhaphy. An oval flap has been removed from the anterior vaginal wall, and the edges of mucous membrane are brought together by a continuous catgut suture, so as to cover the denuded area, A.

support the continuous catgut suture by a couple of interrupted stitches of silkworm gut.

Complications.—The only complication, which is at all likely to occur, is the wounding of the bladder, either while dissecting off the flap or during the process of suturing. On account of the possibility of this accident, it is always safer, as well as being more rapid, to peel off the flap, whenever possible, instead of dissecting it off.

After-treatment.—The after-treatment is similar to that adopted after posterior colporrhaphy. The sutures, being catgut, will be absorbed. The patient may sit up on the tenth day.

REMOVAL OF VAGINAL TUMOURS AND CYSTS.

Solid benign vaginal tumours are either pedunculated or sessile. The former are easily removed by ligaturing and dividing the pedicle; the latter are removed by enucleation after incision of the covering mucous membrane. The cavity left behind can, as a rule, be closed by sutures. If this is impossible it must be plugged with iodoform gauze, which is left in for twenty-four hours and then gradually removed. Malignant tumours must be dissected out as widely as possible. As they usually arise in the vaginal mucous membrane, they require extirpation of the whole or part of the vagina, in which case as clear a sweep as possible must also be made of the para-vaginal tissue and of the inguinal glands. When only part of the vagina is removed, the healthy mucous membrane above and below the extirpated portion is brought together by sutures. If the entire vagina is removed, the uterus also must be extirpated.

Vaginal cysts—if small—are removed in the same manner as vulvar cysts (*v.* page 345).

ATRESIA OF THE VAGINA.

The operation for the cure of vaginal atresia is similar to that recommended by Amussat for creating an artificial vagina.

Operation.—In cases of annular atresia, which is not more than an inch or so in depth, the operation is usually not very difficult, as the patent upper part of the vagina can generally be located and easily opened. To do this, the imperforate end of the vagina is first incised from below under the guidance of a finger in the rectum. The finger is then passed through the incision and the rectum is pushed backwards and the bladder forwards, until the bulging caused by retained menstrual discharge, if any is present, is felt. An opening is made with a trocar into the cavity containing the discharge and then is enlarged with a scalpel, and the accumulated discharge is washed out.

In some cases, it may be then possible to bring the mucous membrane that lines the upper portion of the vagina into contact with the mucous membrane below the obstruction, and to suture it there. If this can be done, it is the best method of ensuring the continued patency of the canal. If this cannot be done, the

entire canal must be plugged firmly with iodoform gauze. This plugging must be changed daily, and continued for some time in order to ensure that the opening remains patent.

In cases of extensive atresia of the vagina, especially when, owing to a non-developed state of the uterus, there is no accumulation of menstrual fluid to serve as a guide to the upper part of the vagina, the operation required is both more extensive and

FIG. 201.—Pfannenstiel and Vineberg's operation for extensive vaginal atresia. The dotted lines show the course of the necessary dissection (*Dudley*).

more difficult. In these cases, the following procedure has been recommended (Pfannenstiel and Vineberg):—Commence by making a preliminary dissection from below between the anus and the urethra, and carry this dissection up as far as can be done with safety (*v.* Fig. 201). Then open the abdomen in the middle line, incise the peritoneum over the bladder, push the latter off the uterus, and open the anterior *cul-de-sac*. A long curved forceps is then passed into this opening and pushed downwards and forwards in the direction of the vulva, and into

the space which had been first opened up by the preliminary dissection below (*v.* Fig. 202). Its passage is guided by the finger in the lower opening. As soon as the point of the forceps has been pushed through into the lower opening, a piece of gauze is caught in it and is drawn upwards, and the end loosely packed in the upper portion of the vagina (*v.* Fig. 203). The abdominal incision is then closed. The projecting gauze forms a guide, and

FIG. 202.—Pfannenstiel and Vineberg's operation for extensive vaginal atresia. Curved forceps introduced from above through the vesico-uterine pouch. (*Dudley*).

the opening can be then enlarged from below to the required extent. Finally, the upper mucous membrane is brought down and is sutured to the lower mucous membrane.

In cases of complete, or almost complete, absence of the vagina, where it is desired to create a passage, various expedients have been adopted in order to provide skin with which to form a lining membrane. If practicable, the best method is to transplant flaps in such a manner as to leave them still partially

attached to their original site. With this object, flaps have been taken from the labia, the perinæum, and the adjoining portions of the thighs.

COLPOCLEISIS.

By colpocleisis (κόλπος, the vagina; κλεῖσις, a shutting up) is meant the permanent obliteration of the vaginal canal at any level. It is an operation which is very rarely necessary.

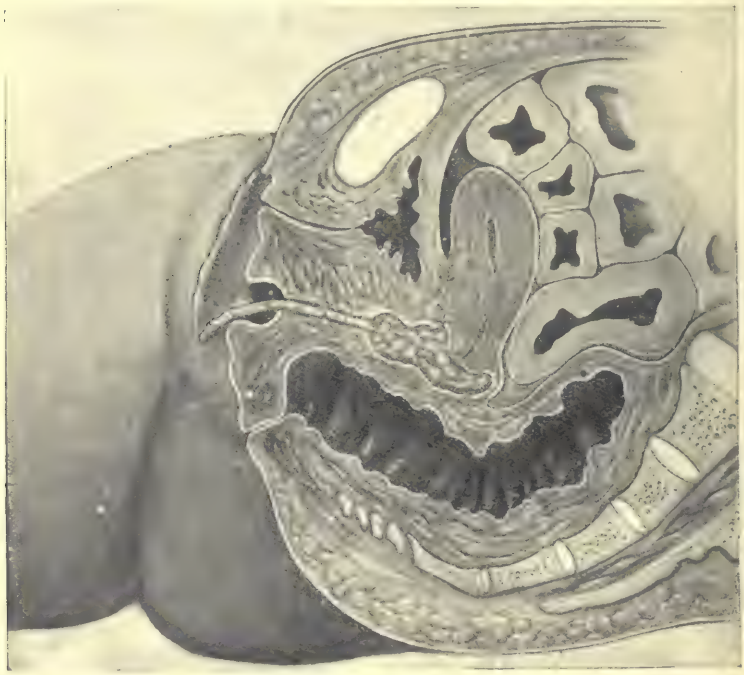


FIG. 203.—Pfannenstiel and Vineberg's operation for extensive vaginal atresia. Gauze packing in the upper part of the vagina, the end protruding through the lower opening (*Dudley*).

Indications.—Colpocleisis may be indicated as a last resource in intractable urinary or fæcal fistulæ, opening into the vagina (*v.* pages 258, 259).

Operation.—In such cases, a circular portion of mucous membrane is removed below the fistula, and the anterior and posterior vaginal wall then brought into contact with sutures.

The opening should be enlarged so as to prevent, so far as possible, the stagnation of urine in the vagina. If the fistula is situated at a very low level, it was formerly sometimes found to be necessary to close not the vagina but the vulva. This operation, which is now never performed, was known as episiorrhaphy (ἐπίσειον, the external genitals; ῥαφή, a seam).

CHAPTER XX.

MINOR OPERATIONS ON THE UTERUS.

Dilatation of the Cervix; Gradual Dilatation, Rapid Dilatation—Curetting—Amputation of the Cervix: Supra-vaginal Amputation, Amputation of the Vaginal Portion—Trachelorrhaphy; Sänger's, Emmet's—Division of the Cervix; Bilateral Division, Posterior Division—Atmocausis and Zestocausis. Removal of Submucous Myomata—Curetting and Cauterisation of Irremovable Malignant Disease—Reposition of Adherent Retro-deviated Uterus.

DILATATION OF THE CERVIX.

Dilatation of the cervix is perhaps the most frequently performed gynæcological operation. It may be carried out by measures which take several days to bring about the required result—*gradual dilatation*, or by measures which obtain the necessary dilatation in from three minutes to a quarter of an hour—*rapid dilatation*.

Indications.—Dilatation of the cervix is indicated in two classes of cases:—

(1) As a preliminary to intra-uterine procedures, either diagnostic or curative, in order to obtain sufficient room to pass the necessary instruments through the cervical canal.

(2) As a mode of treatment in stenosis of the cervix.

Rapid dilatation enables the cervix to be dilated to the size of a No. 8 to 10 Hegar's dilator, and as this size is quite sufficient for curetting, it is the form of dilatation indicated for this purpose. Gradual dilatation enables us to obtain a much greater degree of dilatation of the cervical canal without any danger of the laceration of its muscular walls. Consequently it is the form of dilatation indicated when we require to dilate the cervix above the size of a No. 10 Hegar.

Instruments.—For gradual dilatation of the cervix, the following instruments are required:—A posterior speculum, two American forceps, a sound, sea-tangle tents, Bozemann's catheter, iodoform

FIG. 204.—The position and arrangement of the patient in vaginal operations. C. The cervix drawn down with American forceps. S.S. Sterilised sheets. L.L. Sterilised leggings.

gauze, and a set of Hegar's dilators. For rapid dilatation, the same instruments are required with the exception of the tents and the gauze (*v.* Figs. 146, 147, 9, 11, 10).

Operation.—We must consider the two methods separately.

Rapid Dilatation.—Rapid dilatation is accomplished by means of Hegar's graduated dilators in the following manner:—Pass a posterior speculum, seize the anterior cervical lip in one American forceps and the posterior in another, and draw the uterus down as far as possible (*v.* Fig. 204). Then pass the sound into the uterus in order to ascertain the length and the direction of the cavity, and wash the latter out by means of Bozemann's catheter. Next, push through the inner os the largest-sized Hegar's dilator which will pass. This as a rule is about No. 4. Allow it to remain in position for a moment, and then withdraw it and pass the next larger size, then the next, and so on until it is apparent, by the amount of resistance experienced, that the passage of a larger dilator would cause a laceration. It will facilitate the passage of the dilators if they are first placed in a basin of warm lysol solution.

Gradual Dilatation.—Gradual dilatation is the method indicated in cases in which dilatation above the size of a No. 8 or No. 10 Hegar's dilator is necessary. It can be obtained in three ways, as has already been mentioned (*v.* page 15); they are as follows:—

(1) By the use of sea-tangle tents. This is the method most commonly employed.

(2) By hydrostatic dilators. This form of dilator is never used in gynæcological practice.

(3) By the introduction of a succession of firmly applied intra-uterine tampons of iodoform gauze. Each tampon is allowed to remain in the uterus for twenty-four hours, and the process as a rule requires to be performed some six or eight times to obtain the necessary dilatation.

In order to obtain the maximum amount of dilatation of the cervix, both rapid and gradual dilatation must be adopted. In such cases commence by dilating the cervix with Hegar's dilators as far as is possible without causing laceration, *i.e.*, up to about a No. 8 or No. 10. As soon as this point is reached, further dilatation by means of Hegar's dilators is stopped, and as many sea-tangle tents as the cervix will hold, using small tents in preference to large ones, are passed into the cervix, taking care that they project slightly through the inner os into the uterine

cavity. These tents are allowed to remain in position for twenty-four hours, and are then removed. The cervix is again dilated with Hegar's dilators up to No. 23 to 25, and a fresh set of tents is inserted and allowed to remain in position for a further period of twenty-four hours. At the end of this time, the cervix is usually sufficiently dilated for any procedure. If, however, owing to its great rigidity, it is not sufficiently dilated, a fresh set of tents is again inserted. Each time the tents are inserted, a light tampon of iodoform gauze is placed in the vagina, with the object both of guarding the mucous membrane from injury and of preventing decomposition.

After-treatment.—The patient should always remain in bed for a few days after dilatation has been performed. No other special after-treatment is necessary than that proper to whatever operation has been performed.

CURETTING.

Curetting, curettement, and curettage are the various terms applied to the operation by which the mucous membrane lining the uterus is removed, either for the purpose of diagnosis, or in order to cure some pathological condition.

Indications.—Curetting, as a remedial operation, is indicated in endometritis which does not rapidly respond to milder treatment. Curetting, as a diagnostic operation, is indicated whenever there is a continuous or often recurring discharge—either hæmorrhagic or purulent—the exact cause of which cannot be discovered by other means.

Instruments.—The following instruments are required:—Two American forceps; a posterior speculum; Hegar's dilators, or some modification of them; Bozemann's catheter; uterine sound; and at least two curettes, one for the fundus, the other for the sides of the uterus (*v.* Figs. 9, 146, 147, 10, 11, 205—208).

Of the many different forms of curette perhaps the most generally useful are Martin's, Hegar's, and Sims' flexible curette (*v.* Figs. 205—207). If a douche curette is required, Rheinstädter's is the most serviceable (*v.* Fig. 208). Martin's curette can be used for both the fundus and the sides of the uterus, but it is perhaps most suited for the former. Hegar's curette is used for the sides, it will not curette the fundus.

Sims' curette can be made to serve for both purposes by altering the bend of the stem as is required. It will not remove as large pieces of mucous membrane for macro- or microscopical examination as will Hegar's.

Operation.—The operation of curetting is carried out as follows :—Expose the cervix by passing a posterior speculum.

FIG. 205.—Hegar's curette.

Catch the anterior lip of the cervix with a bullet forceps, and draw it down (*v.* Fig. 204). If the cervical canal is not already dilated, dilate it up to the size of a No. 8 to 10 Hegar, and introduce a Bozemann's catheter and wash out the uterus. Then introduce whatever curette it is intended to use on the sides of the uterus. We recommend for this purpose Hegar's curette, of the largest

FIG. 206.—Sims' curette.

size that will pass through the cervix. Pass the curette up to the fundus, which will be recognised by the resistance it offers, and note the length of the uterine cavity. This is always an important preliminary to the operation, as it enables us subsequently to recognise at once if the curette passes through the uterine wall, an accident which is much more common than is generally

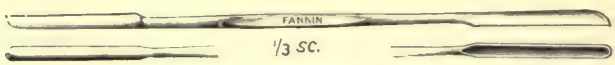


FIG. 207.—Martin's curette.

supposed. The curette is then drawn downwards from the fundus to the inner os, with its cutting edge in contact with the endometrium. It is again passed up to the fundus, and drawn down in a similar manner over the uterine wall with just sufficient change of direction to make it travel over fresh tissue. In this manner, the interior of the uterus is gone over systematically a couple of times, so as to ensure that no spots are left untouched. When the mucous membrane has been removed, the firm and

contracted muscle fibres will impart a grating sensation to the curette as it travels over them, and in this way the operator will know that he has removed sufficient tissue. The curette, which it is intended to use on the fundus, is then introduced, and for this purpose the author recommends either Martin's or Sims' curette. If the latter is used, the handle must be so bent that the cutting edge is the highest point, as otherwise this edge would not come into contact with the fundus. The fundus is curetted by a lateral movement of the curette from left (the patient's) to right. The knowledge of the exact degree of force, with which it is desirable to make the curette press against the mucous membrane, can only be obtained by experience. Speaking generally, the degree of force, which will just cause the uterine muscle-fibre to impart a sensation to the hand as if the curette was travelling over a rough surface, is the correct degree to use.

As soon as the entire surface of the uterus has been well

FIG. 208.—Rheinstädter's flushing curette.

scraped, the fragments of mucous membrane are washed away with a Bozemann's catheter. A caustic solution may be then injected by means of a Braun's syringe (*v.* Fig. 59). For this purpose we are in the habit of using a 50 per cent. solution of formalin. This is allowed to remain in the uterus for from fifteen to sixty seconds, according to the effect we desire to produce, and is then washed away. It is a powerful antiseptic as well as a caustic, it also causes contraction of the muscle-fibre of the uterus, and so tends to check bleeding. Chloride of zinc in a 50 per cent. solution is also used by some operators. Personally we object to its use, as it is difficult to know exactly how far its caustic action may extend. We have both had in our own practice and seen in the practice of others cases in which almost complete obliteration of the cervical canal followed its use. On the other hand, formalin is free from any such after-effect, and at the same time is quite as efficacious. Iodised phenol * is objectionable on account of its smell and other

* Iodine one part, carbolic acid (pure) three parts.

disagreeable properties. Whatever caustic is used is injected with a Braun's syringe, while at the same time a continuous stream of water is allowed to flow over the vaginal mucous membrane in order to prevent the caustic from acting upon the latter. The uterus is finally plugged tightly with a narrow strip of iodoform gauze, the end of which hangs down into the vagina.

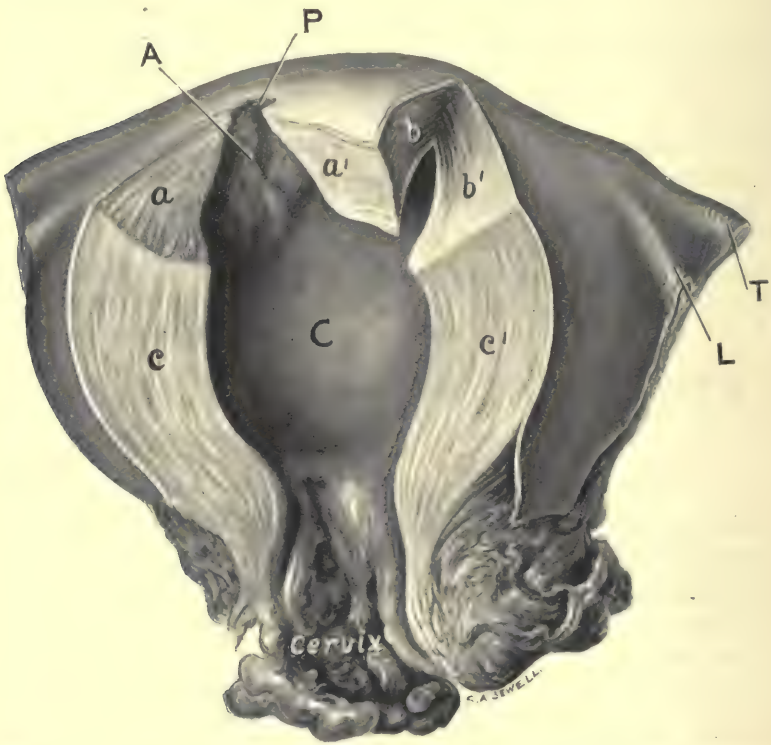


FIG. 209.—Uterus removed in a case of cancer of the vagina. In this case, the sound on being introduced into the uterus perforated the fundus. On subsequent examination it was found that there was a crater-like excavation at the right cornu of the uterus. It extended completely through the muscle, and its roof was formed by peritoneum alone. The patient had been confined six weeks previously. There was no cancer in the uterus. A. Excavation at fundus. P. Site of perforation. C. Uterine cavity. T. Tube. L. Round ligament. The remaining letters indicate surfaces which were in contact before the wall was incised.

Complications.—With the exception of sepsis, there is no very important complication which can occur except the perforation of the uterus by the sound or the curette. The latter accident owes its accompanying risk to the possibility of its permitting or

causing the introduction of septic germs into the peritoneal cavity, and to the fact that, if its occurrence is not noticed, the operator may inject a quantity of a poisonous antiseptic into the peritoneal cavity, rather than to any special danger due to the breach of surface of the uterus. Perforation of the uterus, in the course of an aseptic operation, is, if recognised, of the most trifling importance. Perforation of the uterus, when either its interior or the perforating instrument, is septic, will very frequently lead to fatal results.

Fig. 209 shows an uterus which we perforated with a sound introduced to determine its size. There was no force used, and the fundus did not cause any apparent resistance to the passage of the sound. The uterus was removed immediately afterwards as part of an operation for cancer of the vagina, and we then found the condition shown in the drawing. It is difficult to say positively what caused the loss of tissue in the right cornu, but, in view of the recent occurrence of pregnancy, it is reasonable to attribute the loss to the destructive action of trophoblast which persisted in the placenta.

After-treatment.—The uterine plugging should be removed on the evening of the day following the operation. The patient ought to remain in bed until all hæmorrhagic discharge has ceased. It is advisable to inject the uterus with a caustic solution such as formalin, or to carry the solution in by means of a Bandl's sound, once or twice during the month succeeding the curetting. This is especially necessary in the presence of a chronic enlargement of the uterus, as it hastens involution and encourages the growth of a healthy endometrium.

AMPUTATION OF THE CERVIX.

Amputation of the cervix may be performed either above or below the cervico-vaginal junction. Accordingly, two operations must be described :—

I. Supra-vaginal amputation of the cervix.
II. Infra-vaginal amputation of the cervix.

I. Supra-vaginal Amputation.—Supra-vaginal amputation of the cervix is the term applied to the removal of the cervix above the cervico-vaginal junction.

Indication.—The only indication for supra-vaginal amputation of the cervix is hypertrophy of the supra-vaginal portion of the cervix. The treatment of malignant disease of the cervix by

FIG. 210.—Supra-vaginal amputation of a hypertrophied and lacerated cervix. The cervix, C, has been drawn down, and the vaginal wall has been detached all round. A.V. Anterior vaginal wall. *a*. Site of amputation.

supra-vaginal amputation has now been completely given up in favour of vaginal or abdominal hysterectomy.

Instruments.—The following instruments are required :—Three American forceps; a posterior speculum; small and medium whole-curved needles; a needle-holder; a scalpel; scissors; a

uterine sound; a metal catheter; a toothed dissecting forceps; and half a dozen clip forceps (*v.* Figs. 9, 146, 147, 141, 140, 142).

Operation.—A posterior speculum is passed, the cervix is seized and drawn down by means of two American forceps, one on each lip, and the relationship of the bladder to it is noted by passing a catheter. An incision is then made round the cervix through the vaginal mucous membrane, taking care to keep below the point to which the bladder extends, and, with the finger, the mucous membrane is pushed upwards off

FIG. 211.—Supra-vaginal amputation of the cervix. The vaginal flaps have been trimmed, the cervix amputated, and alternate deep and superficial sutures inserted. A A. Anterior vaginal flaps. P P. Posterior vaginal flaps. C. Stump of cervix.

the cervix, commencing anteriorly and continuing right round (*v.* Fig. 210). When as much of the cervix as it is desired to remove has been exposed, a circular amputation is performed by cutting it straight across at right angles to the cervical canal. The stump is then caught with forceps, a pair being applied to each lip. The vaginal flaps are drawn over the cervix to see how they fit, and any redundancy is cut away. As a rule it will be found advantageous to divide the sleeve of vagina into four flaps, by cutting V-shaped pieces out of it (*v.* Fig. 211), as by so doing the vaginal mucous membrane will cover the cervix more exactly.

Two silkworm-gut sutures are then passed, one through each of the anterior flaps of vaginal mucous membrane, they enter an inch from the edge of mucous membrane, and then pass through the stump of the anterior lip of the cervix from before backwards to emerge through the cervical canal (*v.* Fig. 211). Two more sutures are passed in a similar manner through the posterior flaps of mucous membrane, an inch from the edge, and through the stump of the posterior lip, to emerge again through the cervical mucous membrane. These sutures may now be tied, taking care while doing so to draw the vaginal mucous membrane over the stump

FIG. 212.—Supra-vaginal amputation of the cervix. The sutures tied.

into contact with the cervical mucous membrane, in which position it may be kept by a few superficial catgut sutures (*v.* Fig. 212).

Complications.—The chief accident that may happen is the wounding of the bladder. This is avoided by carefully noting its position at the beginning of the operation, and by pushing it well up out of the way when clearing the cervix. The uterine arteries may be cut, or wounded by the needle, and the peritoneal cavity may be opened. The former of these accidents can be avoided by clearing the cervix thoroughly at the sides and so pushing the arteries upwards, while the latter is of no importance if strict asepsis has been preserved.

After-treatment.—One end of a long and narrow piece of gauze is passed through the cervical canal into the uterus, the remainder being used to tampon the vagina. This gauze is removed on the evening of the second day. The patient is allowed to sit up on the tenth day, and the sutures are removed on the twenty-first day.

II. Infra-vaginal Amputation of the Cervix.—This operation is much more frequently required than is supra-vaginal amputation.

Fig. 213.

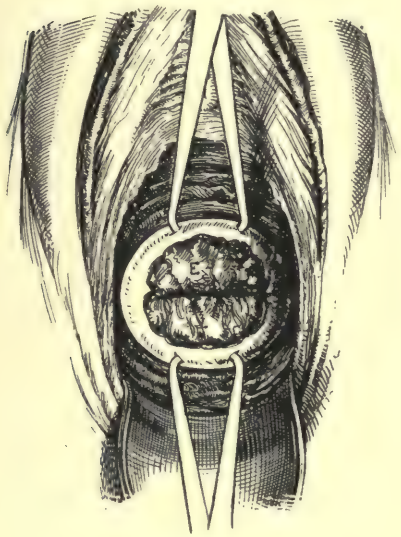


Fig. 214.

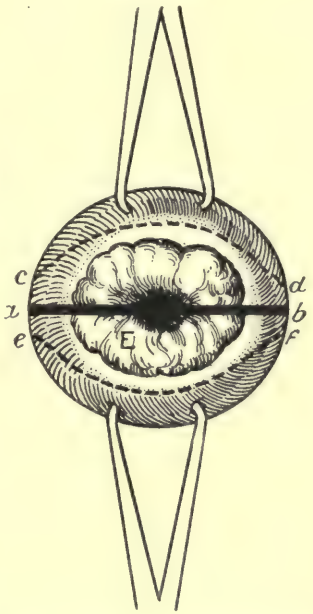


Fig. 213.—Schroeder's amputation of the cervix. The cervix drawn down to the vulva and held in position by two American forceps. E. Erosion.

Fig. 214.—Schroeder's amputation of the cervix. *a*, *b*. The bilateral incision. *c*, *d*, and *e*, *f*. The course of the amputating incisions across the mucous membrane of the cervix.

Indications.—Infra-vaginal amputation is indicated under the following pathological conditions of the cervix :—

(1) A large erosion.
(2) Ectropion accompanied by infra-vaginal hypertrophy.
(3) Infra-vaginal hypertrophy.
(4) Subinvolution affecting the entire uterus.
(5) Stenosis of the lower portion of the cervical canal.

Instruments.—The instruments are the same as those required for supra-vaginal amputation (*v.* page 382).

Operations.—There are two chief methods of amputating the cervix—Schroeder's and Simon-Marckwald's. The former is the more suited for erosions, and for ectropion of the cervix associated with endocervicitis; the latter for cases of infra-

FIG. 215.

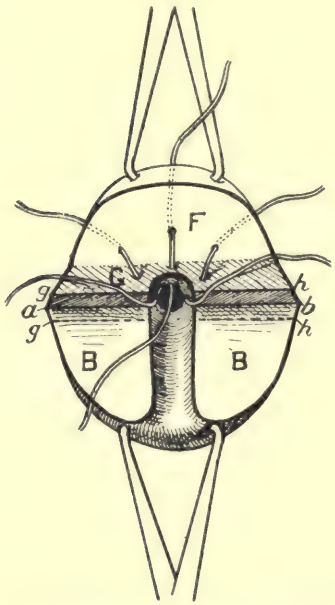


FIG. 216.

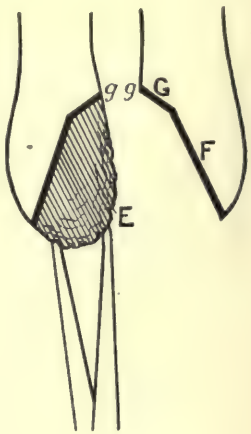


FIG. 215.—Schroeder's amputation of the cervix. A wedge-shaped piece has been removed from the anterior lip by an incision starting at *g*, *h*, to meet the former incision, *c*, *d*, in the depth of the cervix. As a result two raw surfaces, G and F, are left. *a*, *b*. Termination of bilateral incision. *g'*, *h'*. Course of transverse incision across cut surface, B, of posterior lip. The sutures in the anterior lip in position.

FIG. 216.—A side view of Fig. 214. Lettering as before.

vaginal hypertrophy, subinvolution of the uterus, and stenosis of the lower part of the cervical canal.

(A) **Schroeder's Operation.**—Schroeder's operation, which is perhaps more correctly termed an excision of the cervical mucous membrane than an amputation of the cervix, is performed as follows:—

A posterior speculum is passed, the cervix is seized in two American forceps, so placed that they catch the anterior and

posterior lip just above the piece which is to be removed, and the cervix is drawn down to the vulva (*v.* Fig. 213). The cervix is then split transversely, as in supra-vaginal amputation, and so divided into an anterior and posterior lip (*v.* Fig. 214, *a*, *b*). A third forceps then seizes the anterior lip, in the centre of the portion which it is desired to remove, and by means of two incisions which meet one another in the depth of the cervical

FIG. 217.

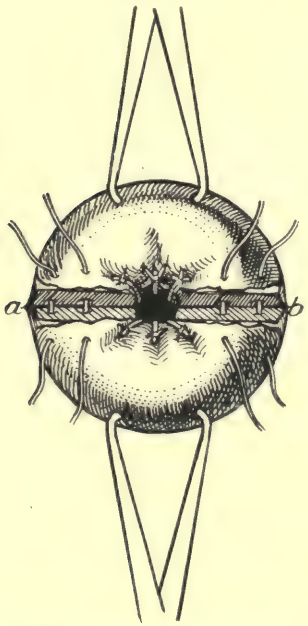


FIG. 218.

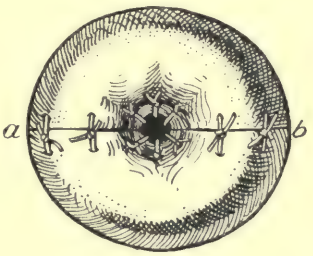


FIG. 217.—Schroeder's amputation of the cervix. The sutures which bring together the surfaces G and F (*v.* Figs. 215 and 216) are tied, and the sutures which close the bilateral incision are in position.

FIG. 218.—The operation completed.

tissue the piece of cervix included in the forceps is cut out (*v.* Figs. 214, 215, 216).

The first incision runs transversely across the mucous membrane covering the anterior lip, and follows the course shown by the line *c*, *d* (*v.* Fig. 214). The second incision runs across the cut surface of the anterior lip, and follows the line *g*, *h*, to meet the first incision in the depth of the cervical tissue (Figs. 215, 216). It should cut the mucous membrane transversely and be

made as high up the cervical canal as possible. This makes the operation somewhat difficult, especially so far as the subsequent exact coaptation of the cut edges is concerned. As a result, many operators—frequently unintentionally—perform the conical amputation of Simon-Marckwald instead of Schroeder's operation.

Three sutures are next passed. These enter just inside the edge of the vaginal mucous membrane, pass beneath the raw

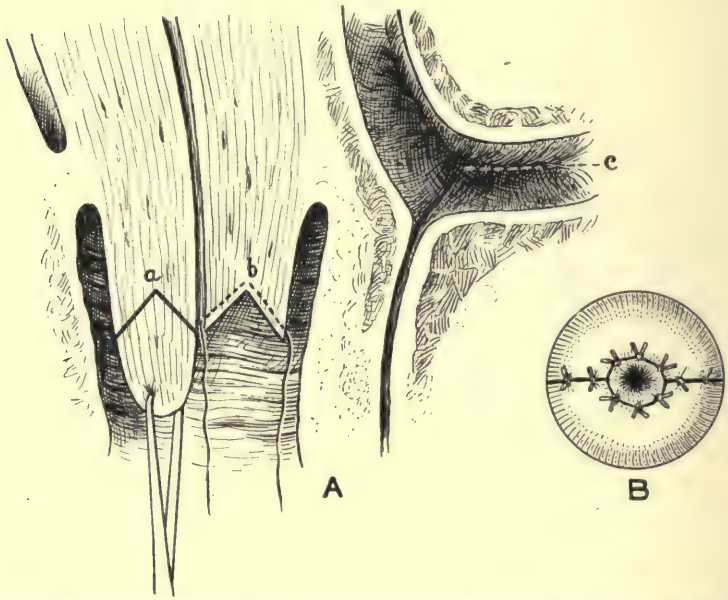


FIG. 219.—Simon-Marckwald's amputation of the cervix. A. On one, *a*, lip the lines of incision are shown, on the other, *b*, one suture is in position ; *c*. The bladder. B. The result of the amputation. All sutures in position and tied.

surface in such a manner that they do not include the depth of the wound (*v.* Fig. 215), and emerge through the cervical mucous membrane. They may be tied at once in order to check bleeding, and they bring the mucous membrane covering the vaginal portion of the cervix into contact with the mucous membrane of the cervical canal. Silkworm gut is the best material (*v.* Figs. 215, 217).

The posterior lip is next treated in like manner, and the sutures passed as in the anterior lip. The last stage consists in passing two sutures at both sides of the os externum to

bring together the edges of the primary transverse incision (*v.* Figs. 217, 218).

(B) **Simon-Marckwald's Operation.**—This operation differs from the preceding in the shape of the removed portion of cervical tissue. The latter is wedge-shaped, and little or no cervical mucous membrane is removed. The coaptation of the cut edges is easier than in Schroeder's operation, and there is consequently not as much risk of subsequent cicatricial stenosis of the cervix.

The steps of the operation resemble those of Schroeder's operation. The cervix is first split transversely, next a wedge-shaped piece is removed successively from each lip, in the manner shown in the diagram (*v.* Fig. 219 A), the resulting gap is closed with silkworm-gut sutures, and finally the edges of the transverse incision are similarly brought together (*v.* Fig. 219 B).

After-treatment.—The after-treatment is like that of supra-vaginal amputation (*v.* page 385).

TRACHELORRHAPHY.

Trachelorrhaphy (τράχελος, the cervix; ῥαφή, a seam) is the term applied to the operation of suturing lacerations of the cervix.

Indication.—Deep laceration of the cervix associated with ectropion of the cervical mucous membrane.

Instruments.—The instruments are the same as those required for supra-vaginal amputation of the cervix (*v.* page 382).

Operations.—There are two principal operations for the repair of cervical lacerations :—

(A) Sänger's operation.

(B) Emmet's operation.

(A) **Sänger's Operation.**—Sänger's operation is especially suited for lacerations which only involve one side of the cervix, although it can also be adopted in the case of bilateral lacerations if required. The anterior and posterior lips are seized in American forceps, and the cervix drawn downwards, and towards the side opposite to that at which the laceration is situated. An incision is then made at each side of the laceration at the junction of the scar tissue and the healthy mucous membrane (*v.* Fig. 220), and by extending these incisions into the cervical

tissue the mucous membrane lining the laceration is dissected up in one piece and drawn inwards towards the centre of the cervical canal. It is thus preserved with the object of forming a new

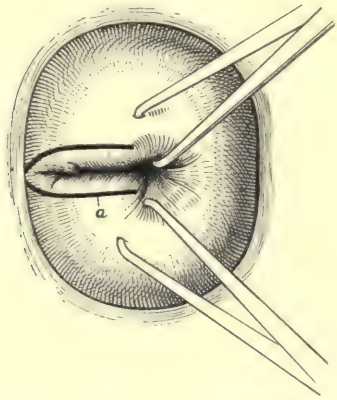


FIG. 220.—Sänger's trachelorrhaphy. *a*. The incisions at each side of the laceration.

FIG. 221.

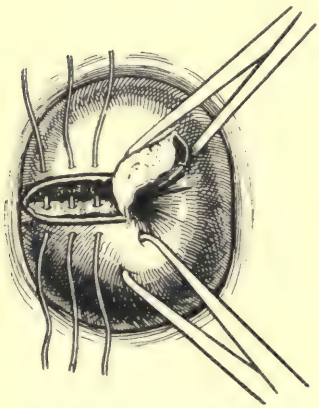


FIG. 222.

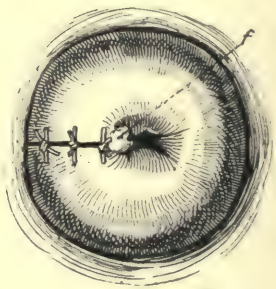


FIG. 221.—Sänger's trachelorrhaphy. The mucous membrane of the laceration dissected up and turned inwards in one piece. Sutures in position.

FIG. 222.—Sänger's trachelorrhaphy. The sutures tied. *f*. The remains of the flap of mucous membrane which was dissected up.

endocervical wall for the laceration (*r*. Fig. 221). Special care must be taken that all the cicatricial tissue at the bottom of the laceration is removed. Sutures of silkworm gut are then passed at right angles to the tear, and tied in such a manner as

to bring the cut edges of cervical mucous membrane together (Fig. 222). The number of sutures necessary depends upon the size of the laceration, and varies between two and four. If there is a second laceration, it is treated in a similar manner.

(B) **Emmet's Operation.**—Emmet's operation is more radical, and is on that account more likely to give a permanently satisfactory result. It is especially suitable for bilateral lacerations.

FIG. 223. FIG. 224.

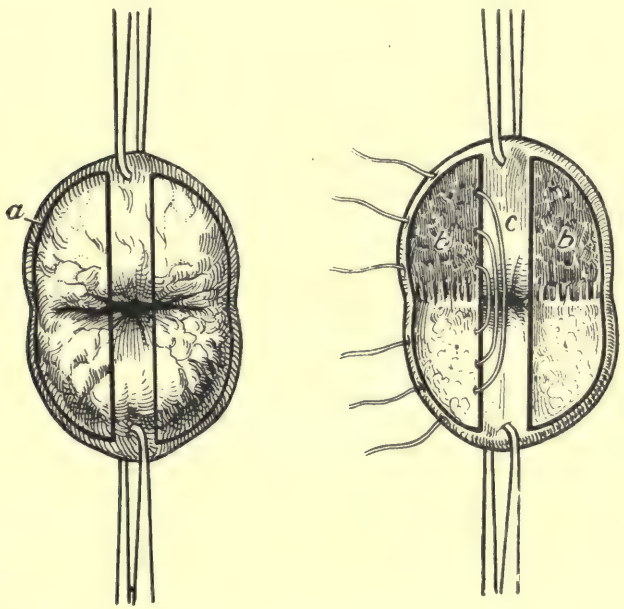


FIG. 223.—Emmet's trachelorrhaphy. The anterior and posterior lips are drawn apart. *a*. The lines of incision marked on the inverted surfaces.

FIG. 224.—Emmet's trachelorrhaphy. The mucous membrane surrounded by the incisions has been removed. Sutures are in position on one side. *b*. Raw surfaces. *c*. Strip of mucous membrane to form the new cervical canal.

The cervical lips are seized, as before, with American forceps, and drawn apart as far as possible. With the scalpel, a transverse incision is made through the bottom of the lacerations, in order to make them both of the same depth. Two antero-posterior incisions are then made on the exposed face of the cervix. They run parallel to what was formerly the cervical canal, and are about a quarter of an inch apart (*c*. Fig. 223). These incisions extend through the mucous membrane alone, and the

tissue between them will form the new cervical canal (Fig. 224, *c*). Two more incisions are then made, one at each side, connecting the ends of the former incisions, as shown. These incisions follow an imaginary line which formerly was the outer limit of the cervical tear, and, consequently, the two areas, lying between each of them and the middle line on the same side, are the areas which must be folded on themselves, and brought together, in order to restore the cervix to its original shape. The next step is the denudation of these areas. This is easily done with the scalpel, and must be complete. The final step is the passing of the sutures. Silkworm gut is the most suitable material, and the manner in which each suture is passed will be easily understood by reference to the diagram (*v.* Fig. 224). Each suture must go down to, but must not include, the strip of mucous membrane

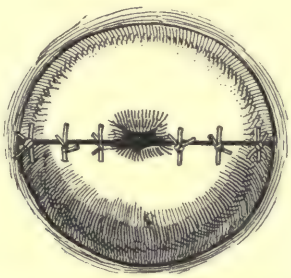


FIG. 225.—Emmet's trachelorrhaphy. The sutures are tied on each side.

which has been left in the centre. When they are tied the cervix will present the appearance shown in Fig. 225.

After-treatment.—The after-treatment is similar to that in the case of amputation of the cervix (*v.* page 385).

DIVISION OF THE CERVIX.

Division of the cervix is performed with the object either of increasing the size of the cervical canal, or of widening the angle of flexion between the axes of the cervical canal and of the body of the uterus.

Indications.—Division of the cervix may be indicated under the following conditions :—

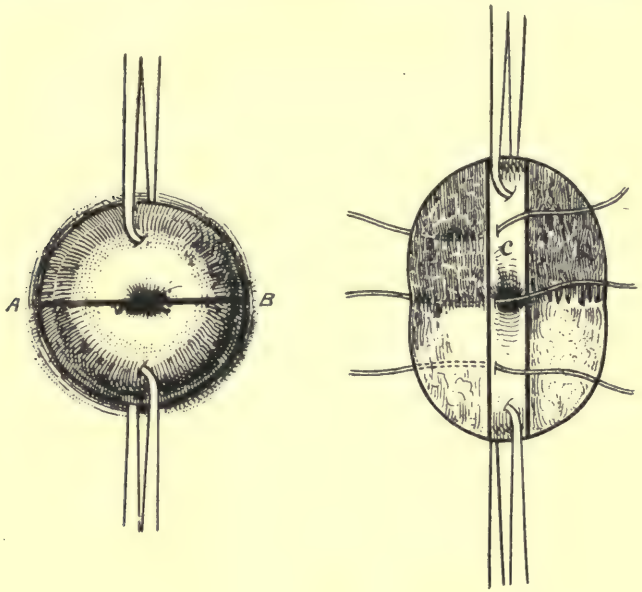
(1) Acquired or congenital stenosis of the cervical canal.

(2) Acquired or congenital acute anteflexion of the uterus.

Instruments.—The instruments are the same as those required for amputation of the cervix (*v.* page 382).

Operations.—Division of the cervix can be performed in two different ways, according to the direction in which the cervix is divided :—

(A) Bilateral division, in which the cervix is divided into an anterior and posterior lip by means of a transverse incision.



I. II.

FIG. 226.—Bilateral division of the cervix. I. A. B. Line of incision. II. Result of incision, sutures in position on one side. *c.* Mucous membrane of cervical canal.

(B) Posterior division, in which a single incision is made vertically in the middle line of the posterior lip.

(A) **Bilateral Division.**—Bilateral division of the cervix, first introduced by Simpson, is the usual method of division, on account of the greater ease with which it is carried out. The anterior and posterior lips are seized in American forceps, and the cervix drawn well downwards. With a scalpel or stout scissors, the cervix is split transversely, as is done in the first stage of Schroeder's amputation operation (*v.* Fig. 226, I. AB). The incision is carried upwards as far as possible

without cutting into the tissues of the vaginal vault. The final step consists in suturing the mucous membrane of the cervical canal to the mucous membrane covering the outside of the cervix. This is done by three sutures at each side, as shown (*r*. Fig. 226, II.). In some cases, there may be a difficulty in bringing the edges together, owing to the rigidity of the cervical tissue. In such cases, this proceeding is facilitated by excising a boat-shaped piece of cervical tissue from the raw surface of each lip, between the mucous membrane of the cervical canal

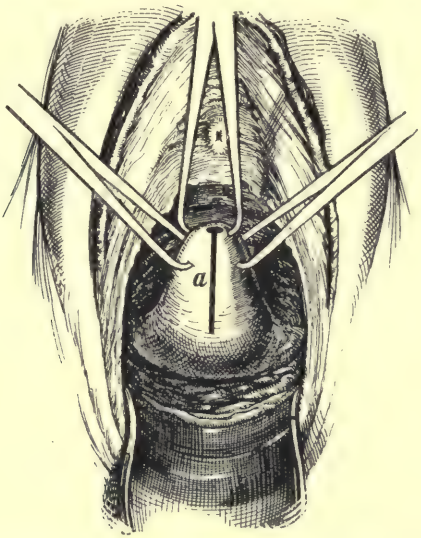


FIG. 227.—Posterior division of the cervix. *a*. Line of incision.

and the vaginal mucous membrane (Chrobak). Bilateral division is well suited for those cases in which the cervical stenosis is limited to the region of the os externum. In stenosis of the internal os, it is of no use, as the incisions do not reach sufficiently high.

(B) **Posterior Division.**—Posterior division of the cervix, introduced by Marion Sims, has two advantages over bilateral division. First, it does not cause as much eversion of the cervical mucous membrane, and, secondly, it is possible to carry the incision sufficiently high to reach the internal os. The operation of posterior division is usually carried out as follows:—Expose

the cervix and seize the posterior lip with two American forceps, one a little to each side of the middle line. A narrow scalpel is then passed into the canal, and by cutting from within outwards, and from the external os upwards, the posterior lip is divided in the middle line up to the vaginal vault (*v*. Fig. 227). Then, by carrying the point of the scalpel up to the internal os, the fibres of the latter also can be divided in the middle line. This incision, however, must only extend through half the thickness of the cervical tissue, as, if it traversed the entire thickness, it

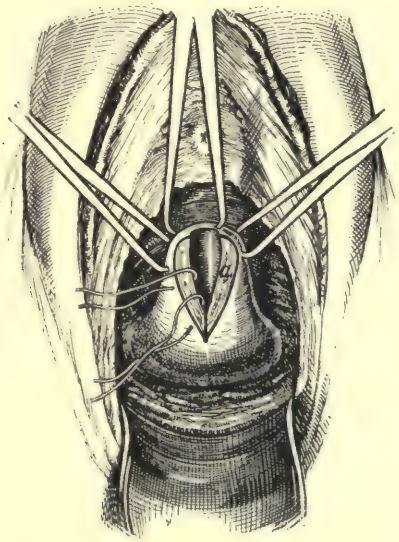


FIG. 228.— Posterior division of the cervix. Result of incision, sutures in position on one side. *a*. Cut edge of posterior lip.

would emerge above the line of posterior peritoneal reflection. Two sutures are then passed, one at each side, and as near the level of the internal os as possible, with the object of bringing the mucous membrane which lines the cervical canal into contact with the mucous membrane which covers the cervix. Each suture is of stout silkworm gut, and is passed with a small whole-curved needle which is entered at one side of the incision through the mucous membrane lining the cervical canal as high as can be reached, and made to emerge at a corresponding point in the mucous membrane covering the cervix (*v*. Fig. 228). A similar suture is then passed at the opposite side of the incision, and

both are tied across the face of the cut surface, in such a manner as to bring the lining and covering mucous membranes of the cervix into contact. If necessary, third and fourth sutures are introduced, one at each side below the former sutures.

A simple and extremely useful modification of this operation has been introduced by Dudley. Its advantages are that no raw surface is left to heal by granulation, as almost always happens in the ordinary posterior division; and that, as well as

FIG. 229.

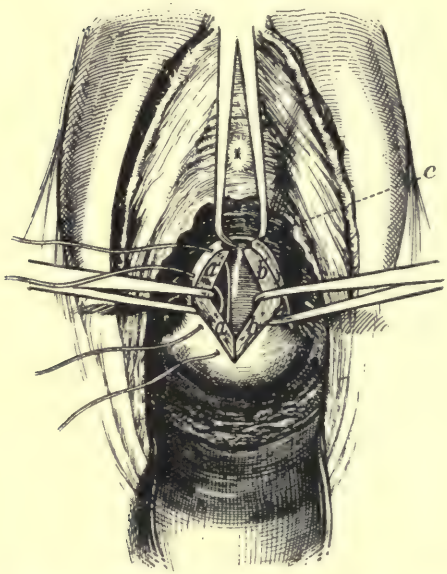


FIG. 230.

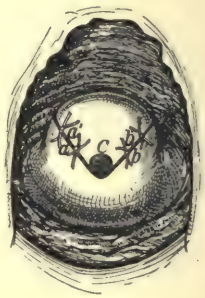


FIG. 229.—Dudley's posterior division. The manner in which the cervix is drawn apart after division, and in which the sutures are inserted. *a*, *a* and *b*, *b*. Cut surfaces of posterior lip. *c*. Os externum.

FIG. 230.—Dudley's posterior division. The sutures tied. Letters as before.

correcting the stenosis, it corrects to a great extent the pathological flexion of the canal which is so often present. It is performed as follows:—The anterior lip of the cervix is seized with a forceps in the middle line and the posterior lip is divided as has been just described (*v.* Fig. 227). In this way, two raw edges are obtained which run the length of the vaginal cervix. The centre of both these raw edges is then caught in a forceps and drawn apart laterally, with the result that the space between the edges becomes lozenge-shaped, and the os externum tends to

approach the posterior fornix (*v.* Fig. 229). Two sutures, one at each side, are then passed, with the object of drawing the os externum up to the top of the fornix, and of turning the original vertical incision into a transverse one, in the centre of which will be the new os externum. The passage of these sutures is the only troublesome part of the operation. A small curved needle, threaded with silkworm gut, is entered through the covering mucous membrane of the cervix at one side, and as near the top of the incision as possible. It emerges through the mucous membrane of the cervical canal, and is again passed from within outwards through the cervical tissue of the same side, and as close as possible to the tip of the cervix (*v.* Fig. 229). A similar suture is then passed through the opposite side of the cervix. If necessary, a second suture may be passed at each side. When the sutures are tied, the os externum is drawn up to the vaginal vault and each raw surface is folded over on itself, so causing its complete disappearance (*v.* Fig. 230). Moreover, the drawing up of the os externum widens the angle of flexion between the axes of the cervix and of the body of the uterus; while the accurate apposition of the raw surfaces to one another facilitates the process of healing, and, by preventing granulation and subsequent contraction of the tissues, affords a better result than a simple posterior division. The steps and result of the operation will be more easily understood by reference to the diagrams.

After-treatment.—The uterus and vagina are plugged lightly with iodoform gauze. Both plugs are removed on the evening of the second day. The patient may be allowed up in from eight to ten days, and the sutures are to be removed on the twenty-first day.

ATMOCAUSIS AND ZESTOCAUSIS.

The term atmocausis, as used in gynæcology, is applied to the cauterisation of the endometrium by superheated steam. The term zestocausis is applied to the cauterisation of the endometrium by means of a metal catheter, which is heated by superheated steam. The use of the caustic effect of superheated steam was introduced into gynæcological practice in 1886 by Snegirew, with the object of providing a method of treating certain cases of uterine hæmorrhage, which did not improve

with the ordinary methods of treatment. The original apparatus devised for this purpose by Snegirew has been greatly improved by Pincus, the indications for and contra-indications to its use have been rendered more precise, and the procedure has been converted from one which was somewhat crude and uncertain to one which is taking its place as a recognised gynæcological operation of considerable importance and value. The operation has been thoroughly tried and approved by gynæcologists who are capable of forming an opinion of its merits, amongst whom may be mentioned v. Winckel and Fritsch in Germany, Macan in Ireland, and Simpson in Scotland. It has also been successfully adopted by many other Continental and American gynæcologists.

The effects of the operation may be divided into two groups :— immediate effects, and remote effects. The immediate effects are as follows :—

(1) Stimulation of the muscle-fibre of the uterus by the heat.
(2) Cauterisation of the mucous membrane and the uterine muscle, by the same agent.
(3) A secondary stimulation of the muscle-fibre, due to the absorption of the condensed water.

The remote effects are as follows :—

(1) A powerful and continuous muscular contraction leading to involution.
(2) A profuse discharge which produces a change in the nutrition of the tissues and carries away infective germs.
(3) The formation of a wall of granulation tissue beneath the superficial necrosis caused by the steam.
(4) An increased flow of blood to the uterus during the period of reaction.

Indications.—The indications for atmocausis or zestocausis as given by Pincus may be divided into two groups—absolute indications and relative indications. The absolute indications for atmocausis are as follows :—

(1) Uterine hæmorrhage which is not relieved or cured by the usual measures, and which is associated with, or due to, the following conditions :—
    (*a*) The preclimacteric period.
    (*b*) Hæmophilia.

(*c*) Inoperable cancer of the body of the uterus.
(*d*) Hæmorrhagic endometritis.
(*e*) Hæmorrhage the result of subinvolution.

(2) To destroy the uterine mucous membrane in cases in which it is desirable to produce sterility in women suffering from incurable diseases, the course of which is prejudicially affected by pregnancy, such as nephritis, phthisis, and cardiac disease, or to obliterate the uterine cavity, as in cases of complete extirpation or closure of the vagina.

The relative indications for atmocausis are as follows :—

(1) Subinvolution which does not yield to treatment.
(2) Cases of metritis in which the use of the curette is indicated, either as an alternative or supplementary to the latter.
(3) Certain cases of bacterial infection of the uterus, such as :—
(*a*) Gonorrhœal endometritis.
(*b*) Septic or saprophytic endometritis.

The absolute indications for zestocausis are as follows :—

(1) When it is desired to cauterise certain circumscribed portions of the endometrium, as the uterine cornua.
(2) Certain cases of dysmenorrhœal endometritis.

The relative indications are as follows :—

(1) When, in a small nulliparous uterus, the use of the curette is indicated for inflammation, we may use the zesto-cautery either instead of or in combination with it.
(2) In cases of obstinate endocervicitis and erosion, as being a milder application than the thermo-cautery or operative measures.

Contra-indications.—As is only to be expected, certain conditions are laid down as contra-indications to atmocausis or zestocausis. Atmocausis is contra-indicated under the following circumstances :—

(1) If there is a possibility or certainty of the case being one of operable malignant disease of the uterus.
(2) If there are any inflammatory or painful complications of the adnexa or the parametrium, especially tubal enlargements.

(3) When there is any exacerbation of the symptoms of the patient during menstruation.

If the patient complains of acute pain during the application of the steam, the operation must be at once stopped.

Zestocausis is contra-indicated in all cases in which the uterine walls are thinned and relaxed.

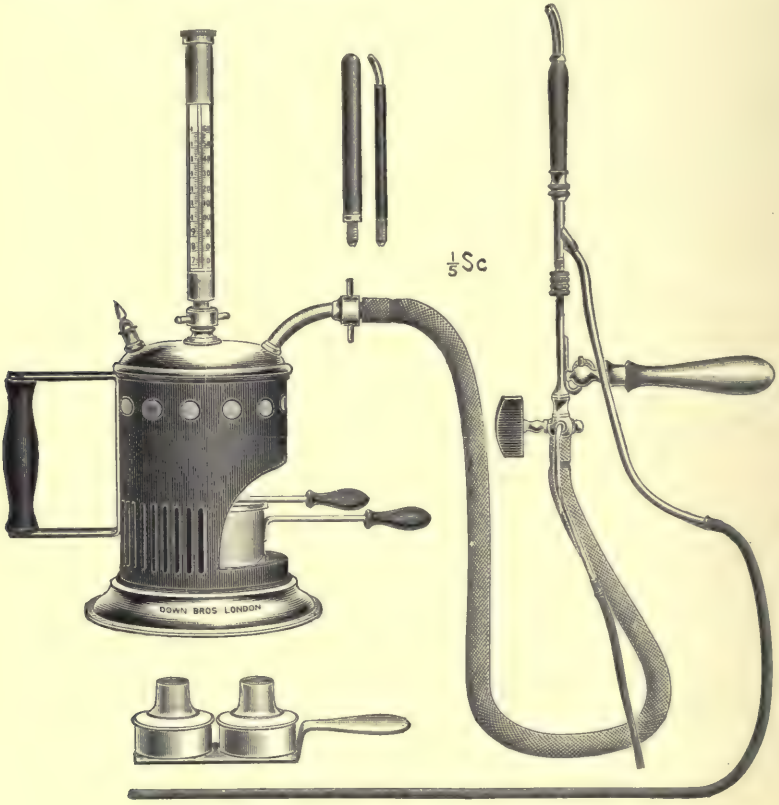


FIG. 231.—Pincus' apparatus for atmocausis.

Instruments.—The improved apparatus devised by Pincus consists of the following pieces (*v.* Fig. 231) :—

(1) A boiler of about twenty-one fluid ounces capacity, capable of resisting a pressure of over two and a half atmospheres, and fitted with a thermometer and safety valve.

(2) An intra-uterine catheter somewhat resembling a Bozemann's catheter, with a wooden handle, two-way stopcock, and three end-pieces for use according to the nature of the case.

The end-pieces for use in atmocausis are open at the ends to allow the steam to escape into the uterus, those for use in zestocausis are closed at the end. The catheter is connected with the boiler by a stout rubber tube of the necessary length.

(3) A set of short wooden specula, to protect the vaginal walls from the escaping steam.

(4) Two specially made volsellum forceps, with removable handles to enable the speculum to be passed over the forceps after the removal of the handles.

Operation.—The use of an anæsthetic is not only unnecessary but inadvisable. The occurrence of pain is a contra-indication to the continuation of the procedure, and for this reason it is well that the patient should be conscious of what is going on. If the case is a suitable one, the discomfort arising from the use of the steam is very slight. The patient is placed on her back, in the usual position, and the cervix is seized with an American forceps and drawn down. The first step of the operation consists in the dilatation of the cervix to the necessary size to allow the fibre-protected catheter to be introduced readily. This dilatation may be effected either by laminaria tents, or by Hegar's dilators. The interior of the uterus is then carefully washed out, and any contained *débris* removed. Previous to this, the boiler has been filled and the necessary head of steam obtained. The amount of water placed in the boiler depends upon the temperature at which it is proposed to use the steam. For temperatures of 100° C. to 105° C. (212° F. to 221° F.), seven ounces of water are poured into the boiler, and for temperatures of 105° C. to 115° C. (221° F. to 239° F.), eleven ounces. The usual temperature at which the steam is used is 110° C.—115° C. If there is hæmorrhage, it is well to use a three per cent. solution of formalin instead of plain water. For ordinary cases, the revolver burner is the best, but for the lower temperatures, or if there is any delay in the operation, the double burner is used, of which only one side need be lighted. If the two-way cock is placed obliquely, no steam can escape from the boiler, and consequently the temperature rapidly rises. The rate at which this occurs can be regulated by the amount of steam which is allowed to escape, and by the kind of burner which is used. The apparatus should stand on a table or on a specially constructed stand.

As soon as everything is ready, the two-way cock is placed transversely, and any condensed water that has collected in the india-rubber tube is expelled. The point of the catheter is now depressed, and the cock turned through a quarter of a circle ; the steam then escapes through the catheter, warming the whole apparatus, and clearing out any remaining water. The cock is now turned back till it is nearly transverse, and, the handle of the instrument being a little depressed, the catheter is quickly introduced into the uterus. As soon as the internal os is completely blocked by the cervix-protector, the cock is slowly turned so as to point along the tube of the catheter. The steam is thus gradually admitted into the uterus, and is allowed to escape for, as a rule, fifteen seconds, commencing to count at the moment the steam begins to escape from the waste steam tube. The catheter should not be allowed to remain in one position in the uterus, but should be moved a little from side to side, so as to avoid the risk of causing necrosis. The fibre cervix-protector must never be so far drawn out as to leave the inner os unprotected, and if steam escapes from the cervix the catheter must be at once withdrawn. The operation should be shortened in proportion to the readiness the uterus shows to contract, the amount of contraction of the uterus being determined by the hand placed on the fundus. Before removing the catheter from the uterus, the steam must be shut off by turning the stop-cock either obliquely or transversely. The catheter should at once be removed if the return tube becomes stopped, except in cases of bad hæmorrhage, as the stoppage of the tube causes the tension and heat of the steam to rise and thus increases its hæmostatic action. In other cases, the tube should be cleared out thoroughly, the uterus washed out with a one per cent. solution of peroxide of hydrogen, and the catheter again introduced. In estimating the time during which the steam should be allowed to work, we must take into consideration the size of the uterine cavity, the thickness of its walls, and, above all, the contractility of its muscular fibre, the rule being to use the highest possible temperature for the shortest possible time.

To perform zestocausis, a temperature of 115° C. is always necessary. A special end-piece closed at the tip is used, through which the steam can circulate without escaping into the uterus. Its stem is covered with indiarubber tubing which can be slipped

up or down in order to expose the desired amount of the tip. The cautery is passed through the cervix as if for atmocausis, and the tip is brought into contact with the uterine wall at whatever point it is desired to cauterise and left there for ten to fifteen seconds. If the patient complains of much pain, the operation must be immediately suspended, and an attempt made to determine the cause of the pain.

After-treatment.—After the performance of atmo- or zestocausis, the patient should remain in bed for at least three or four days.

THE REMOVAL OF SUBMUCOUS MYOMATA.

Under this heading are grouped operations for the removal of pedunculated and sessile submucous myomata, whether growing from the cervix or the body of the uterus.

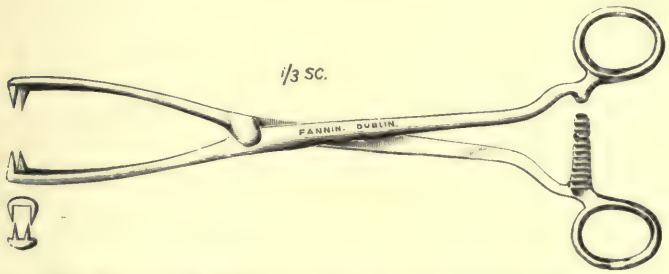


FIG. 232.—Large volsellum with strong teeth, for morcellation.

Indications.—The removal of all pedunculated submucous myomata, and of all sessile myomata, which protrude sufficiently into the uterine cavity to permit of their being removed without the accompanying removal of the uterus, is indicated as soon as they are recognised, as the longer such tumours are left the larger they grow, and the more difficult their removal becomes.

Instruments.—The following instruments are required:—A posterior speculum, a couple of American forceps, large-sized Hegar's dilators (*v.* Figs. 146, 9, 10), three or four large volsella (*v.* Fig. 232), a pair of strong blunt-pointed scissors, an uterine sound, and Schultze's spoon forceps (*v.* Fig. 233).

Operation.—In the case of polypi which spring from the cervix, or which have been expelled from the uterus, removal is easily

accomplished by taking a firm grip of the tumour with an American forceps or large volsellum and rotating it until the pedicle gives way (*v.* Fig. 234, B). If the pedicle is too stout to permit of this, it can be tied and divided with scissors, if it comes from the uterus ; if, on the other hand, it springs from the cervix, its base can be excised by a wedge-shaped incision, the edges of which are then brought together by sutures.

If the tumour lies entirely inside the uterus, the cervix must be dilated with sea-tangle tents and Hegar's dilators as has been described (*v.* page 376), until at least one finger can be passed into the uterine cavity. Then, if the tumour is pedunculated, it can be removed by twisting, in one piece if it is not too large to be brought through the cervical canal, or after by breaking it up, or morcellation, if the reverse is the case. Morcellation is

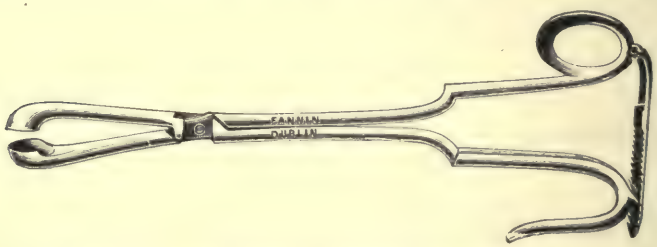


FIG. 233.—Smyly's modification of Schultze's spoon forceps for removing submucous myomata.

accomplished by seizing the tumour in two stout volsella, one of which is used to steady it, while the portion gripped in the other is cut out with strong scissors. Another piece is then seized with the forceps which has been removed, to be in turn cut out, and so on, until the tumour is sufficiently reduced in size to pass through the cervix.

If the tumour is sessile, but at least half of it is protruding into the uterine cavity, it can be removed by means of Schultze's spoon forceps. To do this the cervix must be dilated as widely as possible, and then, under guidance of the finger, the forceps is introduced and a portion of the lowest part of the tumour close to its insertion into the uterus is seized and brought away, partly by the cutting action of the blades of the forceps and partly by twisting it out (*v.* Fig. 234, A). Another piece is then seized and similarly removed, and so on, keeping at first round the base of the tumour as much as possible. By this means a considerable

portion is removed, and the capsule is gradually cut through sufficiently to permit of the remainder of the tumour being brought away in one piece. In the case of a large myoma, the

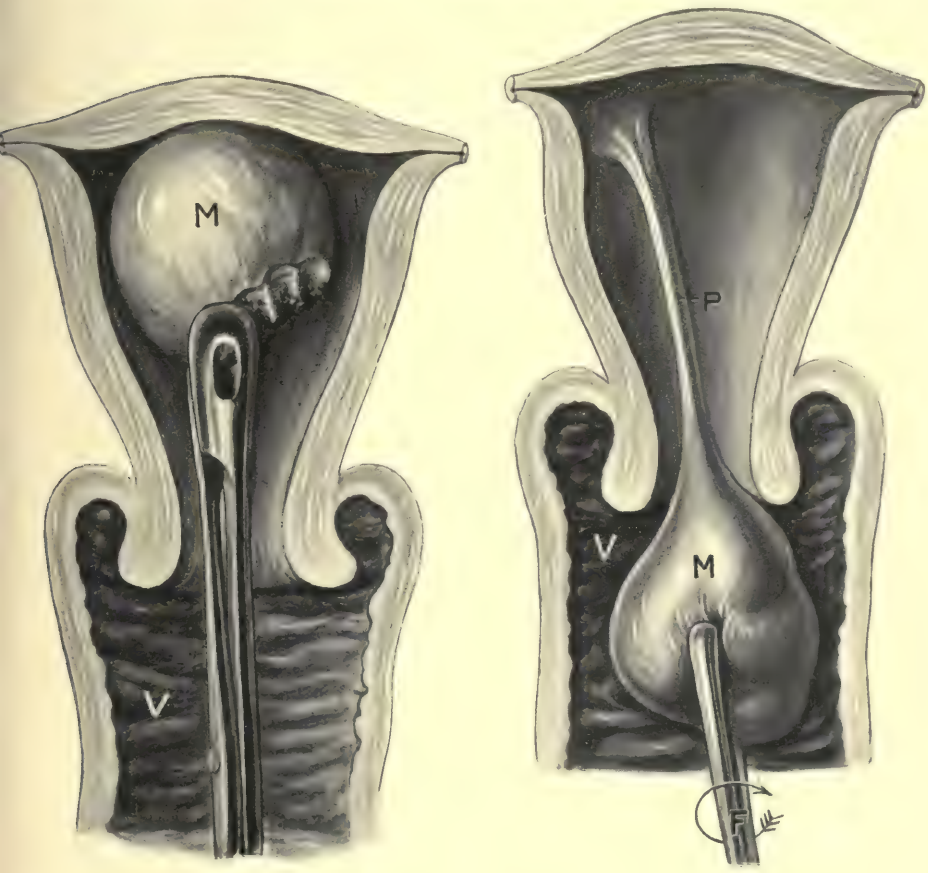


FIG. 234.—Removal of submucous myoma. A. Removal of sessile myoma with Schultze's spoon forceps. B. Removal of pedunculated myoma by torsion. M. Myoma. V. Vagina. P. Pedicle. F. Large volsellum.

process can be hastened by seizing pieces in a stout volsellum and cutting them away with scissors or a scalpel.

If the tumour does not protrude sufficiently into the uterine cavity to enable it to be removed by the foregoing method, it may be necessary to split the wall of the uterus in order to gain access to it. This procedure is carried out as follows:—The

cervix is drawn down with American forceps, and an anterior colpotomy is performed. An anterior retractor (*v.* Fig. 152) is passed into the peritoneal opening so as to protect the bladder, and the anterior uterine wall is split with scissors in the middle line, commencing at the cervix and extending upwards as far as is necessary. Hæmorrhage is controlled by strong downward traction on the cervix, and by catching any spouting vessels in clip forceps. The myoma is thus exposed, its capsule is incised, and it is removed by enucleation, *i.e.*, shelling it out. The resulting cavity is then closed by a catgut suture. The incision in the uterine wall is sutured, and also the incision in the peritoneum and the anterior vaginal wall. In some cases, it may be more convenient to perform a posterior instead of an anterior colpotomy, and to split the posterior uterine wall.

When the whole of the tumour has been removed, the uterus is plugged tightly with iodoform gauze. A hypodermic injection of ergot may also be given to promote contraction of the uterus.

After-treatment.—The gauze plug is to be removed on the evening of the second, or the morning of the third day. If there is much discharge and the uterus is large, a hypodermic injection of ergot may be given daily for a week. After the uterus has returned to its normal size, it is frequently advisable to curette the cavity, in order to cure the endometritis which is usually associated with a myoma.

Complications.—Two serious complications may occur during the removal of a sessile myoma :—an extensive opening may be made into the peritoneal cavity through the base of the tumour ; and, in the case of a myoma springing from the fundus of an inverted uterus, a portion of the uterus may be removed. In the former case, if the opening is not very large and there is no extreme hæmorrhage, it will be probably sufficient to plug the uterus with iodoform gauze in the ordinary manner. The patient must be carefully watched, as, if intra-peritoneal hæmorrhage occurs it will be necessary to remove the uterus, or at any rate to perform a ventral cœliotomy, in order to suture the opening. In the case of the removal of part of an inverted uterus, vaginal hysterectomy is the proper treatment, unless the wound can be satisfactorily closed by suturing.

CURETTING AND CAUTERISATION OF IRREMOVABLE MALIGNANT DISEASE.

The most suitable treatment for those cases of malignant disease of the uterus or vagina which are too advanced for radical treatment, and which cause hæmorrhage or profuse fœtid discharge, is that introduced by Marion Sims.

Indications.—All cases of inoperable malignant disease accompanied by hæmorrhage or fœtid discharge, in which the extent of the growth is not so great as to render it impossible to carry out the treatment without opening into the peritoneal cavity, the bladder, or the rectum, are benefited by this treatment. In some cases the benefit may last for only a few weeks, but in other cases, in which the cancer is slow-growing, benefit may be obtained for many months or even longer.

Instruments.—The following instruments are required:—A large posterior speculum; three vaginal retractors of vulcanite or some other substance which is a bad conductor of heat; a large and sharp curette; a thermo-cautery; plugs of cotton wool soaked in a fifty per cent. solution of chloride of zinc, and dried as far as possible; plugs soaked in a saturated solution of bicarbonate of soda.

Operation.—The first step consists in carefully determining the extent of the growth and its relationship with the rectum and bladder by means of a bimanual recto-vaginal examination, and by passing a sound into the bladder. If the anterior vaginal wall is involved, the interior of the bladder should be examined with Nitze's cystoscope, to see if the mucous membrane is also involved. If this precaution is neglected, an opening may be easily made through the bladder wall in an advanced case. The site of the malignant disease—which is usually the cervix—is then exposed, and as much of the growth as can be safely removed is torn away with the curette. The cavity thus formed is next cauterised thoroughly with the thermo-cautery—using a large-sized platinum point at a cherry-red heat—until the hæmorrhage which resulted from the curetting is almost stopped. The cavity is then dried as thoroughly as possible with plugs of cotton wool, and while dry is filled with small plugs of the same material soaked in a fifty per cent. solution of chloride of zinc. These plugs should be prepared the night before, in order

that they may be dry. The plugs are only placed in the cavity, and must not come into contact with the vaginal mucous membrane. The last step consists in filling the vagina with plugs soaked in a saturated solution of bicarbonate of soda, in order to neutralise any chloride of zinc which may trickle down.

Complications.—The complications, which may occur, are due to the too extensive action of the caustic. In this way, openings may be formed into the bladder or the rectum, or into the peritoneal cavity if the caustic has been introduced into the uterus. Such accidents are of course irremediable, owing to the general condition of the surrounding structures.

After-treatment.—The plugs are removed on the fifth day, unless it is only desired to produce a superficial effect, in which case they are removed on the first or second day. As a rule, there will be a profuse fœtid discharge for several days, until the slough caused by the caustic separates. To check this discharge, vaginal douches of peroxide of hydrogen, sanitas, or permanganate of potash may be given twice daily. As a rule, the patient's temperature rises as a result of absorption from the sloughing area, and she may suffer some pain. For the latter morphia may be given, and for the former stimulants. The general health of the patient should also be maintained as carefully as possible by suitable nourishment. Tonics, such as iron and strychnine, are usually indicated. As soon as all the sloughs have come away and the discharge has ceased, the patient's health will usually undergo considerable temporary improvement.

REPOSITION OF AN ADHERENT RETRO-DEVIATED UTERUS.

The freeing of an adherent retro-deviated uterus by breaking down the adhesions by external manipulation was introduced by Schultze. It is an operation which found considerable favour in the past, as, if successful, it saved the patient from an abdominal or vaginal cœliotomy. It is, however, at best a blind operation, as, even with the greatest care and skill, it is impossible to foresee exactly the extent to which we are carrying the separation of the adhesions, and it is quite possible to tear the intestine

unknowingly, or to open up small collections of pus. Further, it only relieves the adhesions which bind down the uterus, and does nothing for the tubal disease which is usually also present. For these reasons we prefer in such cases to perform abdominal cœliotomy, as this enables us to determine exactly the extent of the inflammation and to adopt satisfactory treatment. Moreover, the improvement which has taken place in the technique of abdominal operations renders such a procedure little, if at all, more dangerous than is Schultze's operation.

Occasionally, however, we may meet with cases in which the uterine adhesions are very friable and easily broken down, and in such cases Schultze's operation may be tried.

Indications.—In the case of a retroverted adherent uterus in which there is reason to believe that the adhesions are friable and that there is not any active infection, or collections of fluid, present in the pelvis, an attempt may be made to break down the adhesions by Schultze's method. If, however, a slight degree of force does not succeed in effecting the desired result, it is better to give up the attempt, and to consider the advisability of adopting other treatment.

Instruments.—The only instrument required is an American forceps (*v.* Fig. 9).

Operation.—With the patient under an anæsthetic empty the bladder, and fill the rectum with water by means of a glass nozzle attached to an ordinary douche can, which is raised sufficiently to give the necessary pressure of water. The index finger of the right hand is then introduced into the vagina, and the middle finger into the rectum, and between them the uterus is raised upwards towards the abdominal wall, carrying with it the adherent rectum. The left hand then depresses the abdominal wall, as if it was trying to push the latter down between the uterus and rectum, and with a to-and-fro lateral movement of the fingers, an attempt is made to wipe off the adhesions, using the abdominal wall in a manner somewhat similar to that in which a sponge is used to separate adhesions in the course of a cœliotomy. If the adhesions are sufficiently soft to be broken down in this manner, they will be felt tearing away under the fingers, and gradually, as they all part, the uterus can be drawn forwards. In some cases it will be found of service to draw the uterus down with an American forceps fixed on the cervix. The last step consists in

inserting a properly fitting pessary to keep the uterus in its correct position.

Complications.—The complications which may result from this operation are injury to an intestine, rupture of small blood-vessels, and rupture of the sac of an unsuspected collection of pus, with consequent dissemination of possibly septic matter.

CHAPTER XXI.

MAJOR OPERATIONS ON THE UTERUS.

Hysterectomy: Ventral Hysterectomy: Partial Hysterectomy; Schroeder's, Kelly's—Vertical Bisection of Uterus—Horizontal Bisection of Uterus: Total Hysterectomy: Doyen's, Kelly's, Werder's: Vaginal Hysterectomy: Without Mutilation of Uterus; Suture Operation, Clamp Operation: With Mutilation of Uterus; By Median Incision, By Morcellation. Myomectomy and Enucleation. Hysteropexy — Ventral, Suspension, Kelly's, Olshausen's; Ventral Fixation, Kelly's, Kocher's. Vaginal Hysteropexy, Mackenrodt's, Dührssen's, Vineberg's. Radical Cure of Inversion.

HYSTERECTOMY.

The term hysterectomy (ὑστέρα, the womb; ἐκτομή, a cutting out), which correctly should be applied only to the entire extirpation of the uterus, has come to be applied to all operations for the removal of the body of the uterus or of the whole uterus, with or without the accompanying removal of the tubes and ovaries. The following table shows the various forms of hysterectomy which are performed :—

Hysterectomy	Ventral	Partial. Total.
	Vaginal (always total)	Without mutilation of uterus. With mutilation of uterus.

VENTRAL HYSTERECTOMY.

Ventral hysterectomy is the term applied to the removal of the body of the uterus, or of the entire uterus through an incision in the abdominal wall.

Indications.—Abdominal hysterectomy is indicated under the following conditions :—

(1) A myomatous uterus in which it is impossible to remove the myomata and to spare the uterus.

(2) Malignant disease of the uterus, except perhaps in its very early stages when vaginal hysterectomy may be indicated.

(3) Certain cases of inflammatory conditions of the adnexa.

Instruments.—The following instruments are required in addition to those given under the head of Ventral Cœliotomy (*v.* page 285) :—Six clamp forceps of various shapes and curvatures (*v.* Figs. 149, 235); four large volsella (*v.* Fig. 232); Doyen's crotchet for extracting the cervix from the vagina (*v.* Fig. 249), or two American forceps; a narrow double-edged

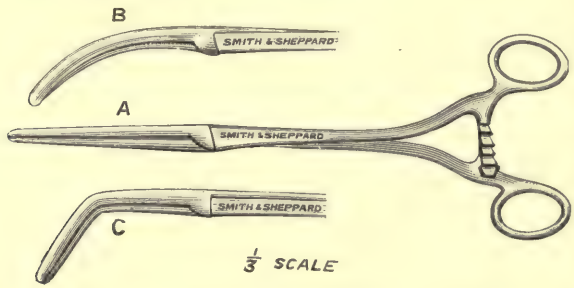


FIG. 235.—Long hysterectomy clamps. A. Straight. B. Curved. C. Elbowed.

knife for dissecting out the mucous membrane of the cervical canal; some form of corkscrew myoma-extractor—*e.g.*, Doyen's (*v.* Fig. 236).

Operations.—The different forms of ventral hysterectomy may be divided into two groups :—

I. Partial ventral hysterectomy.
II. Total ventral hysterectomy.

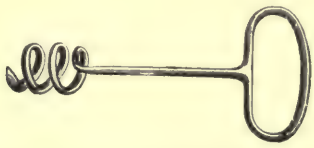


FIG. 236.—Doyen's corkscrew myoma-extractor.

I. PARTIAL VENTRAL HYSTERECTOMY.—Partial ventral hysterectomy, or supra-vaginal amputation of the uterus, is the term applied to the removal of the body and of that part of the cervix which lies above the vaginal insertion, while the remainder of the cervix is left behind. The advantage of this operation over total hysterectomy is that in most cases it can be performed in a shorter time, while the main objection which is urged against it is that in leaving the cervix a possible source of subsequent infection is left also. The improved technique of the operation

has, however, to a great extent, removed this objection, so that it now holds quite as established a position for use in the case of a myomatous uterus as does total ventral hysterectomy. Any form of partial hysterectomy is contra-indicated in malignant disease. There are two chief methods of performing the operation:—

(A) Schroeder's operation.

(B) Kelly's operation.

(A) **Schroeder's Operation.**—Schroeder's operation cannot be regarded as the most suitable or the most rapid method of performing hysterectomy, but in certain cases, where the mode of growth of the myoma renders such procedures as Kelly's hysterectomy difficult, it may have to be adopted, and for this reason we think it well to describe it. Moreover, if the method of performing it is clearly understood, it will be more easy, we think, to understand the alternative methods which we shall describe later.

The steps of the operation are as follows:—

(1) The abdomen is opened in the middle line and the uterus is drawn out through the incision.

(2) The ovarian vessels and the round ligament on one side are clamped, and the broad ligament is divided.

(3) The ovarian vessels, etc., of the other side are similarly treated, and the corresponding broad ligament is divided.

(4) An incision is made through the peritoneum covering the anterior surface of the uterus. It is situated just above the bladder and connects the incisions which divide the broad ligaments. The bladder is then pushed downwards off the uterus.

(5) A similar incision is made across the posterior surface of the uterus, and the peritoneum is pushed down.

(6) The uterine vessels are tied on each side and divided.

(7) The cervix, thus isolated, is cut across just above the vaginal insertion, and the uterus is removed. The mucous membrane of the cervical canal is dissected out, and the resulting opening is closed by sutures.

(8) The clamps on the broad ligaments are replaced by sutures.

(9) The divided edge of the anterior reflection of peritoneum is sutured to the opposite edge of the posterior reflection, in such

a manner as to cover over the cut edges of the broad ligaments and the cervical stump.

(10) The abdomen is closed.

The operation is performed as follows :—The abdomen is opened in the usual manner—the incision being long enough to permit of

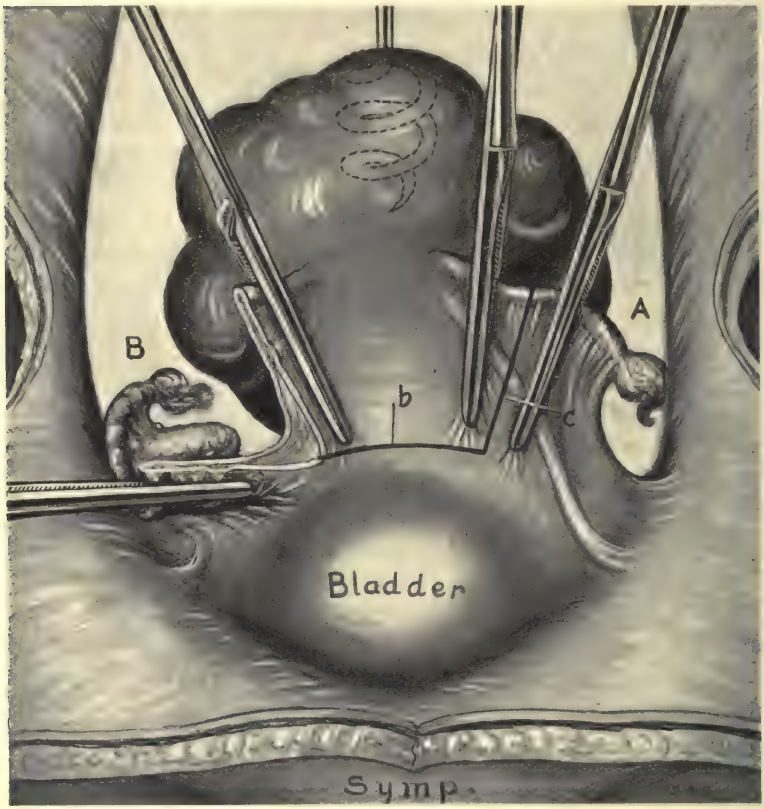


FIG. 237.—Schroeder's partial hysterectomy. On one side, A, the clamps are shown in position on the broad ligament. On the opposite side, B, the ligament is divided. *c*. Site of incision through broad ligament. *b*. Site of incision through peritoneum over the bladder.

the uterus being delivered through it; the patient is then placed in Trendelenburg's position. If possible, the uterus is drawn out of the abdomen, and pulled over towards the right side by an assistant. The ovarian vessels are then clamped, either at the infundibulo-pelvic ligament, or between the ovary and the uterus, according as we desire to remove or to leave the ovary.

In this connection we must again repeat that, save in cases of malignant disease of the uterus, the only justification for the removal of both ovaries is the presence of such an advanced degree of pathological change as to make it impossible to save a healthy portion of even one ovary. The round ligament is also

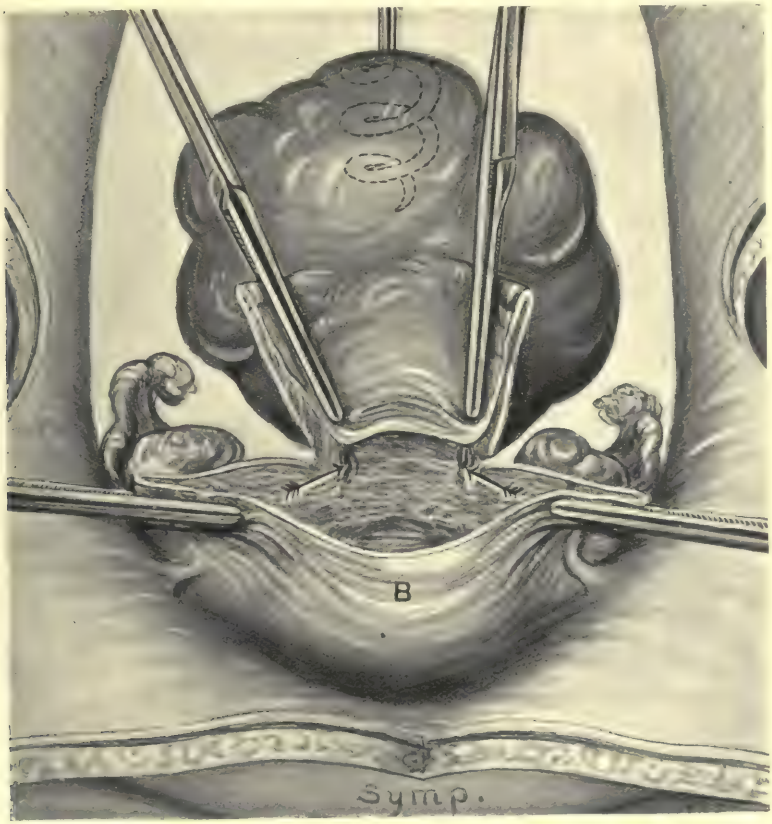


FIG. 238.—Schroeder's partial hysterectomy. The ligaments on both sides are clamped and divided. The anterior flap of peritoneum has been stripped off the uterus. The arrows point to the uterine vessels. B. Bladder.

included in this clamp. The broad ligament controlled by these clamps is then divided, bleeding from the distal ends of the cut vessels being checked by the application of another clamp (*v.* Fig. 237). If necessary, a third clamp is placed so as to control the large veins which run down the side of the uterus. The uterus is then drawn over to the left, and the broad and

round ligaments on the right side are similarly clamped and divided (*v.* Figs. 237, 238).

A transverse incision is next made through the peritoneum covering the anterior surface of the uterus, connecting the incisions in the broad ligament, and a little above the fundus of the

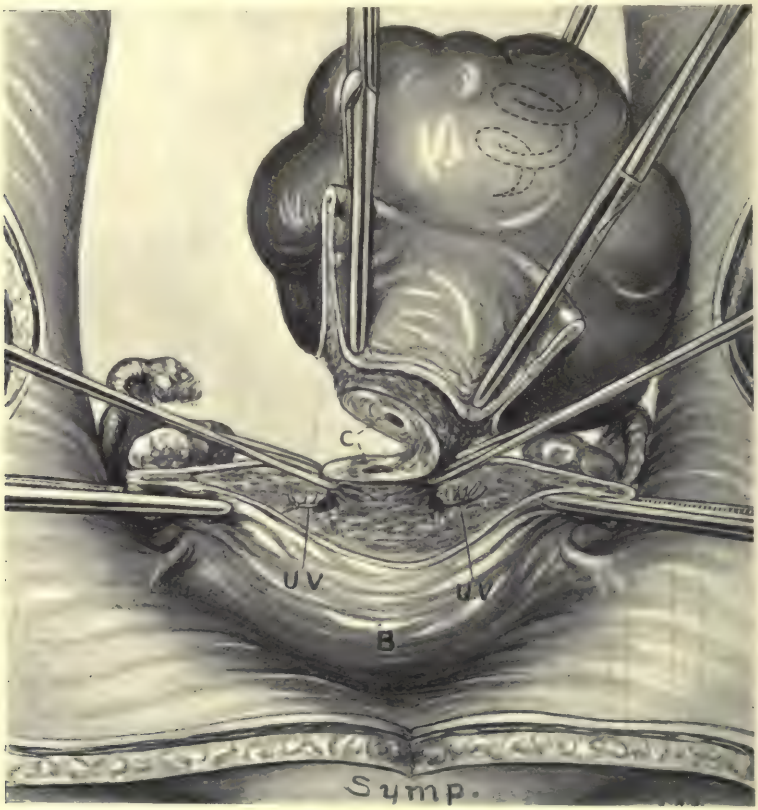


FIG. 239.—Schroeder's partial hysterectomy. The uterine vessels have been tied and cut. The cervix is in process of being cut across. U.V. Uterine vessels. B. Bladder. C. Cervical canal.

bladder (*v.* Fig. 237); and the peritoneum below this incision is pushed down as far as it will go, carrying with it the bladder (*v.* Fig. 238). A corresponding incision is next made across the posterior surface of the uterus, and the peritoneum pushed downwards. The uterine vessels on both sides can now be felt pulsating against the side of the uterus (*v.* Fig. 238). They are

isolated as far as possible—by pushing down any loose connective tissue which lies round them, and then tied and divided, taking care to keep as close to the uterus as possible to avoid any risk of injuring the ureter. The cervix, which is now isolated, is caught on each side with American forceps, and is cut across above the level of the vaginal insertion and above the forceps (Fig. 239). In doing this it is always well to preserve, if possible, the insertion of the utero-sacral ligaments, as, if these ligaments

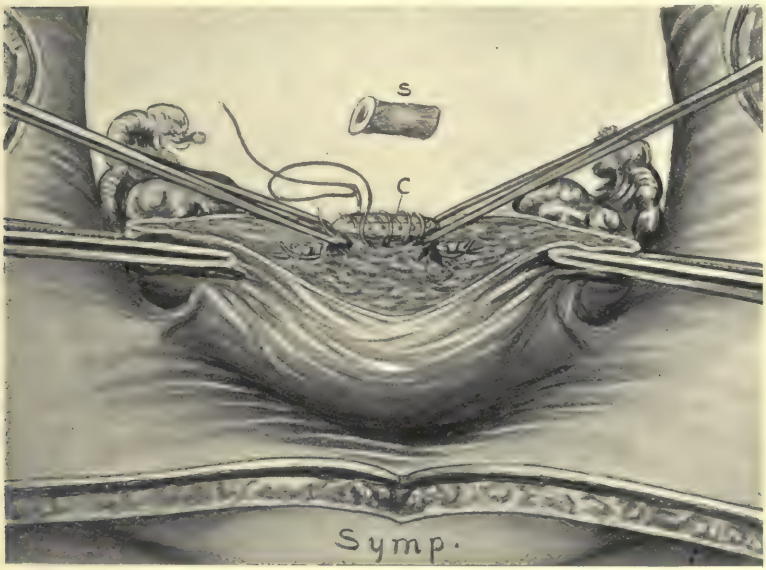


FIG. 240.—Schroeder's partial hysterectomy. The cervical canal has been dissected out, and the cavity left is being closed with a continuous suture. S. Core containing cervical canal which has been removed. C. Stump of cervix.

are left intact, the stump of the cervix preserves its correct position and helps to support the vaginal vault. The upper half of, or if possible the entire cervical canal is then dissected out from above with a sharp-pointed double-edged knife (*v.* Fig. 240), and the resulting cavity is obliterated by bringing its walls together with a continuous catgut suture.

The next step consists in replacing the clamps on the broad ligaments by sutures. Three sutures at least must always be placed at each side (*v.* Fig. 241). The first includes the uterine end of the tube and the subjacent artery ; the second includes the

round ligament and its artery, the third the ovarian ligament and its artery. Any small vessels which still bleed must then be tied one by one.

If it has been found impossible to preserve the attachments of the utero-sacral ligaments, the cut ends of the latter should be carefully sutured to the cervical stump, and similarly the cut ends of the round ligament. By this means the vault of the vagina is supported, and shortening of the vaginal canal is prevented.

FIG. 241.—Schroeder's partial hysterectomy. Suture of the cervix is finished. The clamps on the broad ligaments have been replaced by sutures. C. Stump of cervix.

Finally, the cut edges of the broad ligament and the anterior and posterior peritoneal flaps are brought together by a continuous catgut suture, so as to cover the stump and all raw surfaces. A good method of doing this is shown in Fig. 242.

Another method of dealing with the cervical canal consists in first destroying the mucous membrane by cauterising it with a Paquelin's thermo-cautery, and then excising the cervical canal as described.

(B) **Kelly's Operation.**—Kelly's operation of hystero-myomectomy, as he terms it, differs from the foregoing in that he removes

the uterus as soon as the vessels on one side are tied, leaving the other side to be tied subsequently. The various steps are as follows (Kelly):—

(1) The abdomen is opened, and the patient is then placed in Trendelenburg's position.

(2) The tumour is, if possible, drawn out through the incision.

(3) The ovarian vessels are tied inside the left ovary, unless the

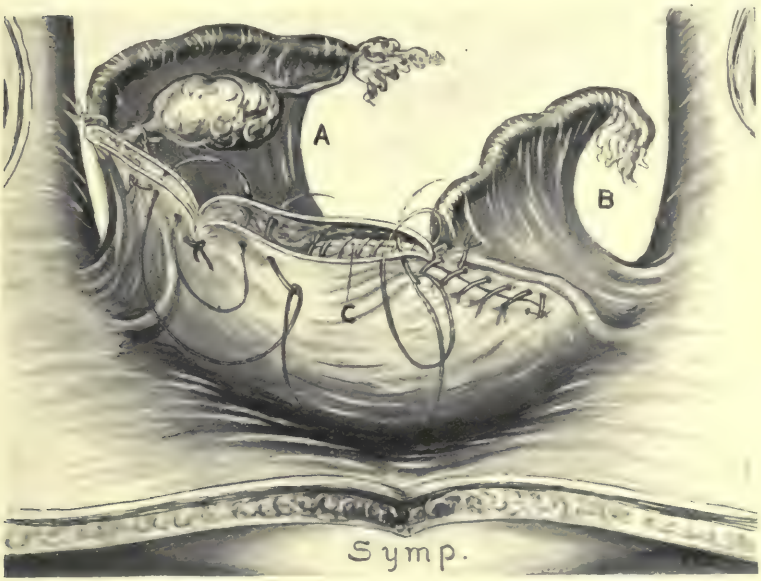


FIG. 242.—Schroeder's partial hysterectomy. Suture of cut edges of broad ligament and peritoneal flaps. On one side, A, a continuous suture is being inserted; and on the other side, B, it is finished.

latter is extensively diseased, when they are tied outside it. The round ligament is also tied, and the top of the broad ligament is opened.

(4) The utero-vesical fold of peritoneum is detached from side to side, and pushed well down so as to separate the bladder from the cervix.

(5) The uterine vessels of the left side are tied.

(6) The uterus is amputated at the level of the cervix leaving a cup-shaped pedicle.

(7) The uterine artery, the round ligament, and the ovarian

FIG. 243.—The vascular relations of the uterus, ovary, and Fallopian tube on the left side, as seen from the front. The anterior leaf of peritoneum has been removed. The relations of the ureter to the uterine artery are well seen. Ur. Ureter. U.A. Uterine artery. U.V. Uterine vein. Ov. A. Ovarian artery. Ov. V. Ovarian vein. (*Kelly.*)

vessels on the right side are clamped, and the uterine body is removed.

(8) The clamps are replaced by ligatures.

(9) The cervical stump is sutured.

(10) The peritoneum is drawn together over the bottom of the pelvis.

(11) The peritoneal cavity is cleansed.

(12) The abdominal incision is closed.

The first four steps of this operation are identical with the preliminary steps of Schroeder's operation. The essential difference then appears, as, instead of proceeding to clamp the vessels of the opposite broad ligament, the next step consists in incising the peritoneum, which covers the anterior surface of the

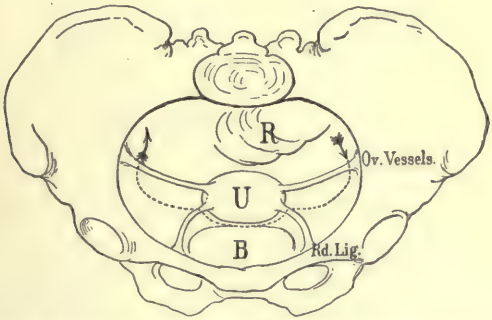


FIG. 244.—Kelly's hystero-myomectomy. Diagram showing the line of incision, beginning with the left ovarian vessels and ending with the right.

uterus, and in displacing the peritoneum and bladder downwards. This brings into view the uterine vessels of that side, and they may be brought into still greater prominence by dividing with the scissors the sharp edge of the peritoneum covering the posterior surface of the uterus, as in the former operation. The vessels are then tied with silk and divided, any vessels which may have escaped from the first ligature being caught with a forceps and tied separately.

The next step consists in amputating the uterus through the cervix. This should be done in such a manner as to leave a cup-shaped depression in the stump, in order to permit of its more easy closure by sutures. A little mucus as a rule escapes from the cervical canal as it is divided, and this should be carefully removed. Any vessels that bleed in the stump may be

temporarily controlled by clip forceps. As soon as the cervix is divided, the uterine vessels of the opposite side appear and are caught in a clamp (*v.* Fig. 245). Kelly recommends not to clamp them at the level of the divided cervix, but to roll the uterus still further over to the left, until the separation between the cut surfaces amounts to several centimetres, and then to clamp the vessels at this higher level, as by this means they are subsequently tied at a safe distance from the ureter. As

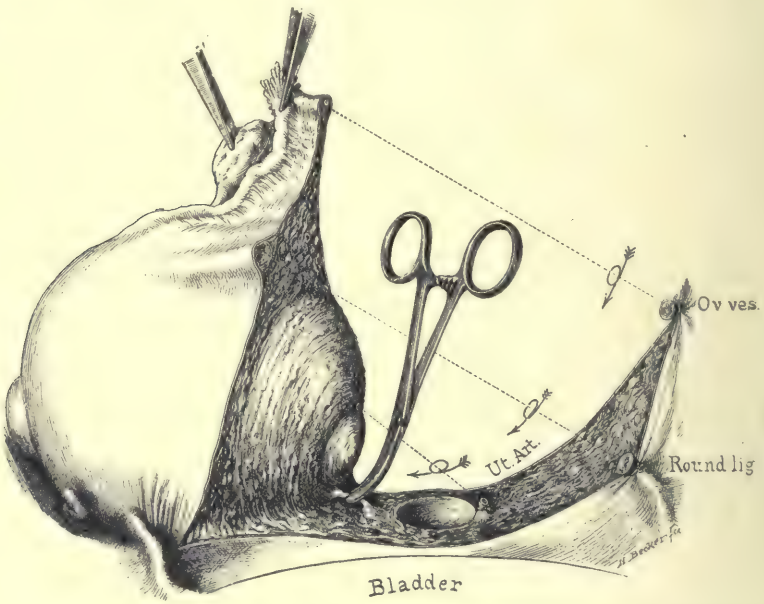


FIG. 245.—Kelly's hystero-myomectomy, showing the manner in which the uterus is detached from left to right. (*Kelly.*)

soon as the uterine vessels have been clamped and divided, the uterus is rolled still further outwards (*v.* Fig. 246), and the right broad ligament, which now alone holds it, is secured with two clamps placed to the inner side of the ovary, unless it is necessary to remove the latter, and is divided.

The uterus being thus removed, the clamps which are on the right uterine artery and vessels of the broad ligament are replaced by ligatures. The uterine artery is the first to be tied, and, to render it more accessible, the stump of the cervix is seized with an American forceps and drawn upwards. The

vessel is then picked up in an artery forceps and tied. The other vessels are then similarly treated. As soon as this is done, any bleeding points in the cervical stump are picked up and tied, or included in a suture passed into the cervical tissue. The cup-shaped cavity in the stump is then closed by from three to five catgut sutures which are passed from before backwards and are tied separately. If there is any evidence of

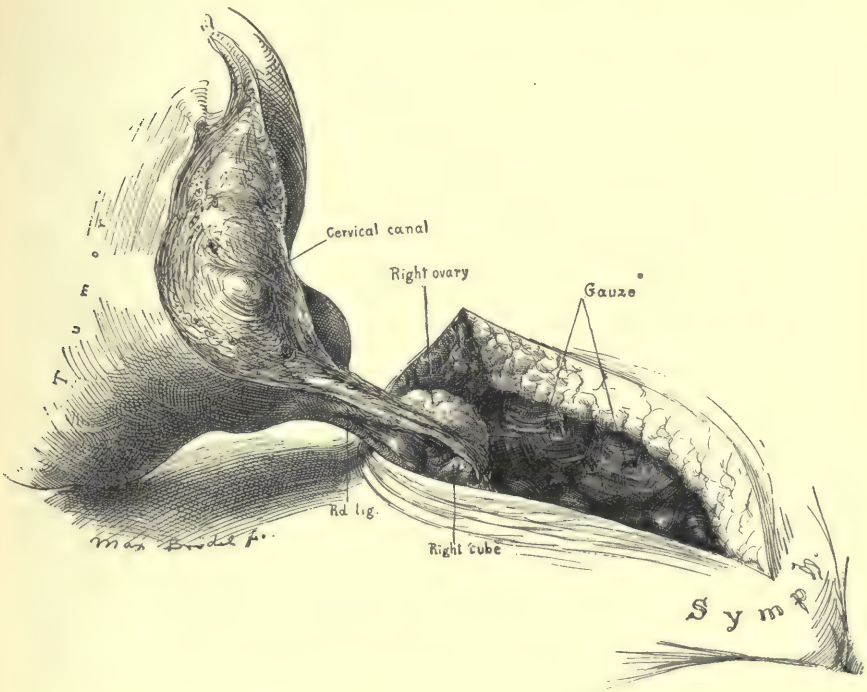


FIG. 246.—Kelly's hystero-myomectomy. The uterus has been rolled out of the abdomen, and is attached only by the right round ligament, ovary, and tube. (*Kelly.*)

infection of the cervical canal, the latter should be dissected out, or this course may be adopted as a routine practice in all cases.

The final step of the operation consists in suturing together the cut edges of the broad ligament and the anterior and posterior flaps of peritoneum in such a manner as to cover over the cervical stump as in Schroeder's operation. This is done with a continuous catgut suture.

In cases of extensive inflammatory disease of the appendages, in which the adhesions are so dense that the removal of the appendages alone cannot be effected, or in which the uterus is also extensively diseased, the removal of the latter organ may be necessary. In such cases, owing to the complete blocking

FIG. 247.—Vertical bisection of the uterus in inflammatory conditions of the adnexa, Kelly's method. The uterus has been bisected vertically and the right half drawn upwards. (*Kelly.*)

of Douglas' pouch by the adherent appendages, any of the ordinary forms of hysterectomy may be impossible, and we may be compelled to perform the modification of Doyen's operation described later (*v.* page 433), in which the anterior *cul-de-sac* is opened and the cervix drawn up through this opening instead of through an opening in the floor of Douglas' pouch,

or we may have to resort to bisection of the uterus in the manner which we shall now describe. Such a bisection may be made either vertically through the middle line of the uterine body or horizontally through the supra-vaginal portion of the cervix.

Vertical bisection of the uterus is indicated in cases in which the adhesions are so dense as to prevent the separation of the appendages, and in which the fundus can be freed posteriorly so

FIG. 248.—Vertical bisection of the uterus in inflammatory conditions of the adnexa, Kelly's method. The uterine body has been completely separated and the uterine vessels tied. (*Kelly.*)

as to make its bisection possible. The operation as performed by Kelly is carried out as follows:—The fundus is first exposed and drawn strongly upwards by means of two large volsella, one applied at each cornu. The body is then split mesially from above downwards to, or a little below, the line of vesical reflection. When the uterus is thus split, it is caught again across the cut surface by a second set of forceps as shown in Fig. 247. The upper forceps can then be removed. One of these forceps is

next drawn firmly upwards, and the cervix is cut across horizontally (*v.* Fig. 247) until the broad ligament commences to appear. Great care must be taken at this point to avoid wounding the uterine artery. This step is facilitated by taking a lower grip with the forceps so as to turn up the cut cervical end. The uterine vessels are then tied or clamped and cut.

The half-cervix can now be drawn still further upwards and the round ligament tied or clamped. The uterine cornu may then be in turn clamped and the half-uterus removed, or the separation of the appendages may be continued and the appendages and half-uterus removed together (*v.* Fig. 248).

The opposite half of the uterus is similarly treated and removed with the appendages of that side.

Horizontal bisection is indicated in cases in which, owing to the manner in which the body of the uterus is completely buried in adhesions in Douglas' pouch, vertical bisection is impossible.

In such cases, Kelly recommends the separation of the bladder anteriorly, after first incising the peritoneum above it. The supra-vaginal portion of the cervix is thus exposed, and is caught with a strong volsellum and drawn upwards. It is then cut across horizontally from side to side, taking extreme care to avoid the uterine vessels. The upper portion is drawn upwards away from the lower portion, and the uterine vessels are exposed and can be tied and divided. If necessary, vertical bisection of the uterine body can be next performed, and access to Douglas' pouch thus obtained. The adherent appendages can then be separated from the floor of the pouch, and removed together with the uterus.

If collections of pus are present in Douglas' pouch, or if there is reason to believe that the infection is still active, it is necessary to make an opening through the floor of Douglas' pouch and to drain with gauze into the vagina (*v.* page 297).

II. Total Ventral Hysterectomy.—Total ventral hysterectomy is the term applied to the removal of the entire uterus. It may be performed in any case instead of partial hysterectomy, and is always indicated in cases of malignant disease of the uterus. It can be performed in several ways, of which the chief are :—

(A) Doyen's operation.
(B) Kelly's operation.
(C) Werder's operation.

(A) **Doyen's Operation.**—This is the most rapid method of removing a myomatous uterus in certain cases. It is not a suitable operation in cases of malignant disease, as it does not enable us to effect a wide removal of the parametric structures. The steps of the operation are as follows :—

(1) The patient is placed in Trendelenburg's position, the abdomen is opened, and the uterus drawn out into the wound.

(2) The posterior vaginal fornix is opened from above by cutting with a scalpel on to a curved forceps pushed upwards through the vagina.

(3) The opening is enlarged, and the cervix is seized in Doyen's crotchet (*v.* Fig. 249) or with an American forceps and drawn upwards into the peritoneal cavity.

(4) The lateral attachments of the cervix to the vagina are divided with a scissors. This allows the cervix to be pulled up

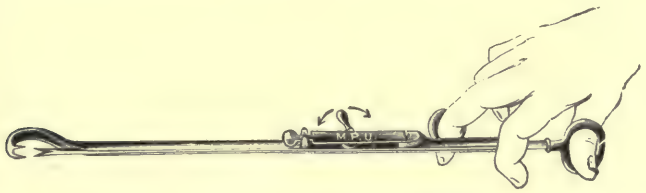


FIG. 249.—Doyen's crotchet extractor, for drawing the cervix upwards through the opening in the posterior fornix in complete hysterectomy.

still higher, and the anterior lip to be seized in the crotchet—if this was not done previously.

(5) The mucous membrane of the anterior fornix is divided, and the cervix, pulled still further upwards, quickly detaches itself from the bladder from below upwards.

(6) The broad ligaments on each side are clamped and divided, and the tumour, thus set free, is removed.

(7) The uterine and ovarian vessels are picked up separately and tied, the clamps are removed, and any further vessels that bleed are tied.

(8) The vaginal opening is closed by a few sutures, and finally the peritoneal flaps are drawn together by a purse-string suture so placed as to cover over the divided stumps of the ligaments and the vaginal opening.

The operation is performed as follows :—As soon as the abdomen is opened, the uterus is drawn out into the wound, a

cork-screw extractor (*v*. Fig. 236) is screwed into it, and an assistant pulls it down forcibly over the pubes so as to expose Douglas' pouch to the fullest extent (*v*. Fig. 250). A long curved forceps is then passed into the posterior fornix of the vagina, and pushed upwards against the mucous membrane in such a manner as to indicate its position beneath the peritoneum of Douglas' pouch. An opening is next made into the vagina by cutting down on the forceps with a scalpel, the forceps is pushed through into the peritoneal cavity, and the opening enlarged by separating the blades. A suture is then passed through the peritoneum and the vaginal mucous membrane just below this opening, and tied, with the object of providing a tractor which will subsequently draw the posterior edge of the vaginal opening into view after the removal of the uterus. The operator then passes one finger into the vagina, and, under its guidance, the posterior, or if possible the anterior, lip of the cervix is seized either in an American forceps or in Doyen's special crotchet extractor, and drawn forcibly upwards through the opening (*v*. Fig. 251). This procedure is facilitated by making a vertical incision through the peritoneum covering the posterior aspect of the uterus immediately above the opening in the vaginal vault, as this provides additional room for the cervix (*v*. Fig. 250, *b*). The anterior lip of the cervix can then be caught in a forceps, if this has not been previously possible.

The mucous membrane of the lateral fornices of the vagina, and the lateral attachments of the uterus to the vagina, are then divided with a scissors curved on the flat, taking care to keep as close as possible to the sides of the cervix. This permits the cervix to be drawn still further upwards and brings into view the mucous membrane of the anterior vaginal fornix, which is divided in turn, still taking care to keep as close to the cervix as possible. By pushing upwards with the finger, the connective tissue between the bladder and the uterus is then exposed, and by dragging the cervix forcibly upwards with the forceps, the bladder is completely separated from the cervix (*v*. Fig. 252). This separation is assisted by passing the finger upwards from the vaginal opening, and is extended laterally towards the broad ligaments in such a manner as to detach a large flap of peritoneum. The tip of the finger is then passed through the peritoneum, and the opening thus made is

extended across the surface of the uterus. By this procedure, the uterus is completely freed from its posterior and anterior attachments, and is now connected with the pelvis by the broad ligaments alone (*v.* Fig. 253).

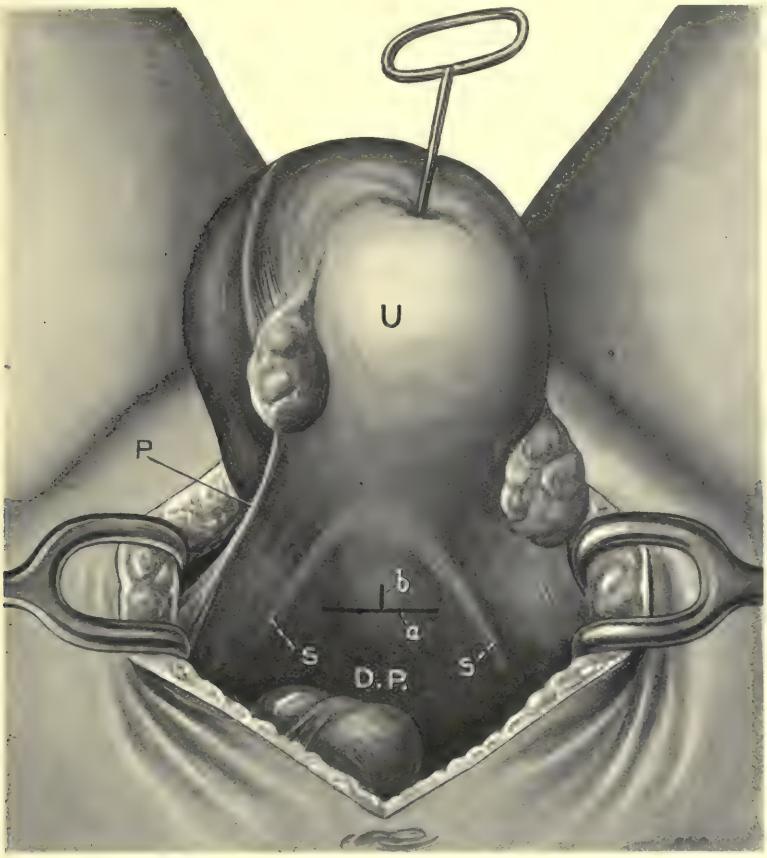


FIG. 250.—Doyen's total hysterectomy. The uterus is drawn forcibly upwards, and an incision is made from Douglas' pouch into the posterior vaginal fornix. *a*. Transverse incision. *b*. Short vertical incision. D.P. Douglas' pouch. S. Utero-sacral ligaments. P. Infundibulo-pelvic ligament. U. Uterus.

The next step consists in clamping the right broad ligament with a clamp applied between the ovary and the uterus, and in cutting through the ligament (*r.* Fig. 253). The uterus is then drawn over to the left side, the left broad ligament is similarly clamped and divided, and the uterus is removed. In each case,

the line of division should be kept so close to the uterus as to shave the uterine tissue, as by this means it will often be found that not the main trunks of the vessels but their smaller branches

FIG. 251.—Doyen's total hysterectomy. The anterior lip of the cervix is caught with a bullet forceps, and the cervix is drawn forcibly backwards and upwards through the opening in Douglas' pouch The anterior and lateral vaginal attachments of the cervix are then divided. *a*. Incision through vaginal mucous membrane. C. Cervix.

are cut (Doyen). Two clamps will be required on each side, one on the uterine vessels, and the other on the ovarian vessels and the round ligament.

The uterus being now removed, the next step consists in replacing the clamps by ligatures, and in removing the appendages if necessary. In simple cases, two sutures on each side are sufficient. One of these is passed through the broad ligament

FIG. 252.—Doyen's total hysterectomy. The cervix, freed from its vaginal attachments, is drawn still further upwards, and strips itself off the bladder. U.V. Uterine vessels.

and tied inside the ovary, while the second is placed on the uterine vessels. The vessels should however be picked up and tied separately, and consequently, if the branches of the uterine artery are divided, several sutures may be required. The clamps are then removed one by one, and any vessels which are still untied are picked up and tied. Small vessels will

frequently be found in the parametric tissue between the peritoneum and the vaginal mucous membrane.

As soon as all bleeding points have been tied, the posterior edge of the vaginal opening is drawn into view by means of the

FIG. 253.—Doyen's total hysterectomy. The anterior reflection of peritoneum is incised, and the right broad ligament is clamped and divided. P. Peritoneum covering bladder.

silk ligature which was passed through it at the commencement of the operation, and the vaginal mucous membrane surrounding the wound is caught with forceps in two or three places and brought into view. Its edges are then brought together with a continuous catgut suture and the opening thus closed. It is always advisable to suture the divided ends of the utero-sacral

and the round ligaments to the vaginal wall, so as to give all possible support to the vaginal vault.

The final step consists in bringing together the divided edges of the broad ligament, and of the anterior and posterior flaps of peritoneum, in such a manner as to bring the ovaries into a suitable position and to cover the vaginal opening (*v.* Fig. 242). For this purpose, Doyen recommends a purse-string suture of catgut. This is introduced through the left tubo-ovarian pedicle, and then passed successively through the posterior flap of peritoneum, the right tubo-ovarian pedicle, and the anterior flap of peritoneum. The free end of catgut which was left at the left tubo-ovarian pedicle is then again passed through the eye of the needle and brought from left to right through the anterior flap of peritoneum to meet the other end. The two ends are then tied tightly with a double knot. If the peritoneal flaps are not of sufficient size to allow of their being brought together in this manner, the divided ends of the broad ligaments may be sutured together in the middle line, and then the anterior and posterior flaps of peritoneum sutured to them by a continuous suture.

The foregoing short description of Doyen's operation briefly outlines the method in which it is performed in favourable cases, when the size or the situation of the myoma is not such as to prevent the uterus from being drawn out of the abdomen, and when Douglas' pouch can be exposed. In certain cases, however, the shortness of the broad ligaments or the presence of large myomata in Douglas' pouch may render modifications of the operation necessary. If the broad ligaments are too short, the first step of the operation must consist in dividing them in order to allow the uterus to be drawn upwards. If large myomata are found in Douglas' pouch, which prevent access to the posterior vaginal fornix, Doyen recommends their preliminary enucleation, and in exceptional circumstances the opening of the vagina through the anterior fornix. This modification is also usually necessary in the presence of adnexal inflammatory enlargements filling Douglas' pouch.

(B) **Kelly's Operation.**—The method devised by Kelly and his pupils of performing total hysterectomy in cases of malignant disease of the uterus must not be confused with Kelly's method of performing partial hysterectomy in cases of myoma. The object of the operation with which we are now dealing is to effect the

complete removal of the uterus, of as much of the parametric tissues as possible, and of as much of the vagina as is necessary according to the extent to which it is involved by the malignant disease.

FIG. 254.—Kelly's hysterectomy for carcinoma. Incision of the anterior and posterior folds of the broad ligament. Ligature of the infundibulo-pelvic and round ligaments. (*Kelly.*)

The steps of the operation are as follows :—

(1) A few days before the operation all sloughing or necrotic tissues are removed with the curette, and the vagina disinfected as completely as possible and plugged with iodoform gauze.

(2) Immediately prior to the operation, the ureters may be

catheterised in order to enable them to be more easily distinguished.

(3) The abdomen is opened, and a broad peritoneal apron is made from the peritoneum of the anterior abdominal wall, and is sutured to the pelvic brim so as to wall back the intestines out of the field.

FIG. 255.—Kelly's hysterectomy for carcinoma. Freeing the uterus anteriorly and pushing down the bladder. (*Kelly.*)

(4) The posterior fold of broad ligament is incised, the infundibulo-pelvic ligament is tied and divided; the anterior fold of broad ligament is incised; and the round ligament is tied and divided.

(5) This procedure is repeated on the opposite side, and the peritoneum is divided across the anterior surface of the uterus and just above the bladder.

(6) The bladder is detached from the uterus.

(7) The uterus and the posterior peritoneal flap on the right side are drawn to the left, the ureter being carried with the flap, and the uterine artery is tied as near its origin from the internal iliac as possible.

(8) The parametric portion of the ureter is freed from its sheath, and the ureter is pushed away from the posterior peritoneal flap.

FIG. 256.—Kelly's hysterectomy for carcinoma. Exposing and tying the uterine artery. (*Kelly.*)

(9) The incision in the posterior flap is continued down to the right utero-sacral ligament, which is tied and divided.

(10) Steps 7, 8 and 9 are repeated on the left side.

(11) The peritoneum covering the posterior vault is divided, and the rectum freed from the posterior vaginal wall.

(12) The parametric portion of the ureter on the right side is drawn outwards towards the side of the pelvis, the parametric tissues are tied as near as possible to the pelvic wall and excised.

(13) This step is repeated on the left side.

(14) The vagina is freed laterally and anteriorly to a point below that to which the cancer has extended.

(15) The vagina is clamped with right-angled clamps, one applied below the other, and is severed between the clamps with a thermo-cautery, and the tumour removed.

(16) If possible the pelvic glands are removed.

(17) The anterior peritoneal flap is sutured to the anterior vaginal wall, and the posterior flap to the posterior wall, a gauze drain is inserted, and the abdomen is closed.

The operation is carried out as follows:*—A preliminary

FIG. 257.—Kelly's hysterectomy for carcinoma. Splitting the sheath of the parametric portion of the ureter. (*Kelly.*)

removal of necrotic tissue having been performed, if possible a day or two before the operation, and the ureters having been catheterised immediately prior to the operation, the abdomen is opened in the middle line by an incision from the symphysis to the umbilicus. Kelly advises that the peritoneum should not be divided for the upper third of this incision, but that a broad apron of peritoneum should be left, which can be sutured to the peritoneum of the posterior edge of the pelvic brim in such a manner as to form a protection-dam to keep back the intestines from the field of operation.

This step accomplished, the posterior fold of the broad ligament is incised at a point about a centimetre below the ovarian

* Abridged from Kelly's description of the operation.

ligament. The incision is made parallel to the ovary and extends out to the infundibulo-pelvic ligament. This ligament is then

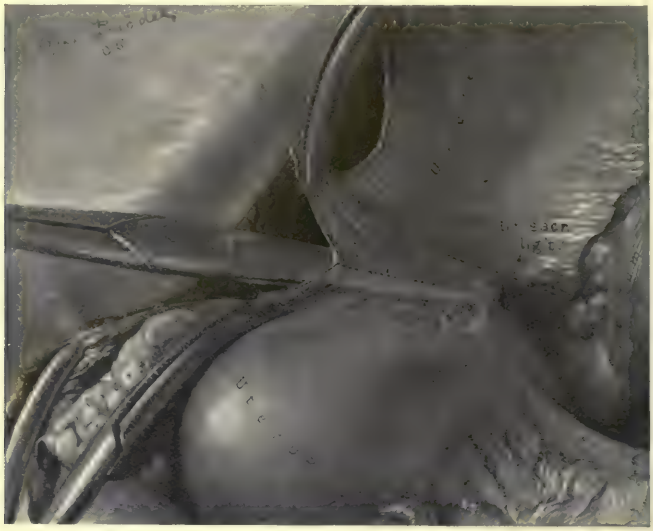


FIG. 258.—Kelly's hysterectomy for carcinoma. Freeing the peritoneal attachments of the uterus posteriorly. (*Kelly.*)

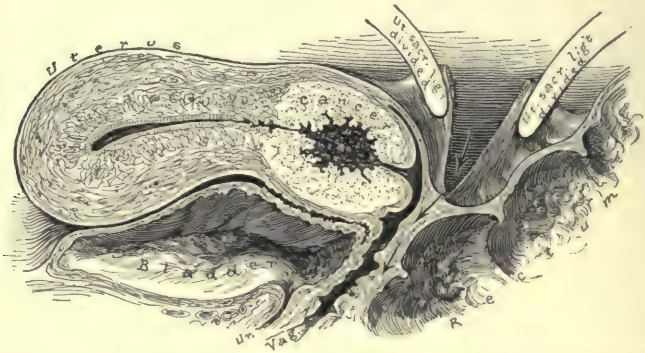


FIG. 259.—Kelly's hysterectomy for carcinoma. The utero-sacral ligaments are cut. The arrows show the direction of the dissection which will free the uterus and vagina posteriorly. (*Kelly.*)

tied and divided, the anterior fold of peritoneum is incised as is shown by the dotted line (*r*. Fig. 254), and the round ligament is tied and divided. The opposite ligament is then treated in a similar manner, and the incision through the peritoneum forming

the anterior fold of the broad ligament is continued across the front of the uterus. Next, the bladder is pushed down off the uterus (*v.* Fig. 255).

The uterus is next drawn to one side, and the posterior peritoneal flap is drawn towards the middle line (*v.* Fig. 256). Since the sheath of the ureter is adherent to this flap, the ureter is drawn with the latter out of the way. The uterine artery is then found, and is tied as near as possible to its point of origin. The sheath of the ureter is then opened so as to expose the portion which passes through the parametrium, and the ureter is thus

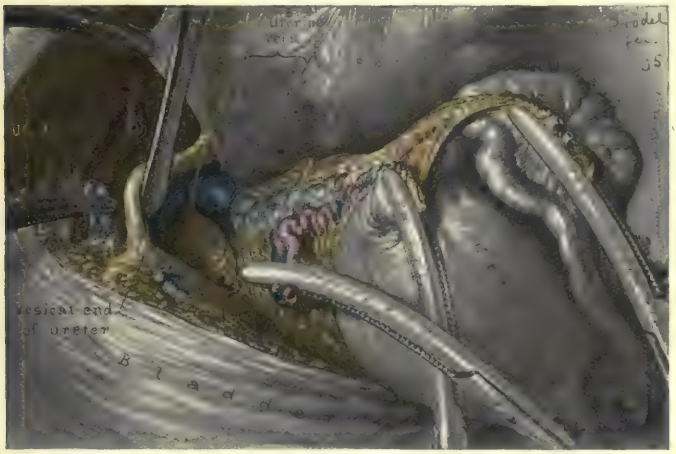


FIG. 260.—Kelly's hysterectomy for carcinoma. The ureter is drawn outwards and parametric tissue is excised as widely as possible. (*Kelly.*)

freed from the parametric tissue (*r.* Fig. 257). Great care must be taken in carrying out this procedure, as, if the peri-ureteral plexus of blood vessels is injured, necrosis of the ureter may result.

The next step consists in pushing away the ureter from the posterior flap of peritoneum at the place where it enters the parametrium. The peritoneum is divided up to the utero-sacral ligament, which is tied and divided (*v.* Figs. 258, 259). The uterine artery is then tied and the ureter separated on the opposite side, the utero-sacral ligament on that side is divided, and the peritoneum is incised over the posterior vaginal vault. The rectum is then freed from the posterior vaginal wall by means of the fingers or a gauze sponge.

The uterus can now be drawn somewhat higher out of the pelvis, and this renders the removal of the parametric tissues easier. The parametric portion of the ureter is gently and carefully drawn towards one side of the pelvis, and the cervix is freed

Stump of inf. pelv. lig.
Hypog A.
Sup ves. A.
Cerv., vag. + ves veins
(3d group, - below 2nd)
Ut. veins
(2nd group, - below ureter)
Ut. A. + V.
(1st group. - above ureter)

FIG. 261.—Kelly's hysterectomy for carcinoma. Exposure of the lower plexus of pelvic veins preparatory to their ligation. The veins converge towards the point marked by a cross. (*Kelly.*)

laterally, and at the same time as much as possible of the parametric tissues is removed (*v.* Fig. 261). During this stage, there is usually free hæmorrhage from large veins coming from the uterus, vagina, and bladder, and these must be tied as they are divided.

The lateral ligaments of the upper part of the vagina are next

tied and divided, and the vagina is separated from the surrounding structures to a point below the lowest extension of the disease. The vagina is wiped dry from below and clamped

FIG. 262.—Kelly's hysterectomy for carcinoma. Removal of the cancerous uterus through the abdominal incision. The vagina is clamped below the cervix and the growth by two clamps one below the other, and its walls are then burned through between the clamps. (*Kelly.*)

with two right-angled clamps (*r*. Fig. 262), placed one above another, and its walls are burnt through with a Paquelin's cautery. The uterus, the upper part of the vagina, and the upper

clamp are then removed through the abdominal incision, which must be well protected by gauze so as to avoid any soiling with vaginal discharge. The lower clamp is then released, the anterior and posterior vaginal walls are caught in forceps, and a piece of gauze is pushed down through the vagina from above, to wipe away any necrotic tissue which may be lying in it. Any blood vessels which are bleeding in the cut edges are then tied.

If the condition of the patient is sufficiently good, the glands round the internal and external iliac vessels should be removed, and also if possible those in the hollow of the sacrum. If the condition of the patient is not satisfactory, this part of the operation may have to be abandoned.

The penultimate step consists in covering with peritoneum the raw surface which is left at the bottom of the pelvis. To do this the utero-vesical peritoneal pouch is sutured to the anterior vaginal wall, and the utero-rectal pouch to the posterior vaginal wall. A gauze tampon is then placed in the pelvis, the end of which is brought down into the vagina.

Finally, the peritoneal apron, if one has been made, is released, and the abdominal wall closed in the ordinary manner.

(c) **Werder's Operation.**—Werder's operation differs from the foregoing operations in that, although all the necessary steps, for the detachment of the uterus from the surrounding parts and for the ligation of vessels, are performed by the abdominal route, the uterus is finally removed *per vaginam*. It might on this account be included under the head of vaginal hysterectomy, but as by far the greater part of the operation is performed from above, we prefer to describe it here.

The advantages of Werder's operation are that it permits the free removal of the greater part of the vaginal mucous membrane in addition to the entire uterus, and that it enables this to be done without opening into the vagina from above, and consequently diminishes the risk of carrying septic or malignant infection from the vagina into the peritoneal cavity. On this account, it is of value in cases of malignant disease of the cervix which has extended on to the vaginal mucous membrane.

The steps of the operation are as follows :—

(1) All broken down malignant tissue is curetted away from the cervix. If possible, this step is done a few days before the day fixed for the removal of the uterus.

(2) The ureters may be catheterised in order to define clearly their position.

(3) The abdomen is opened, and the ovarian vessels and round ligaments are tied.

(4) The bladder is separated from the uterus and the broad ligaments.

(5) The base of the broad ligaments is thus opened up, and the uterine vessels and the ureters are located. The former are tied as close to their point of origin as possible.

(6) The bladder is separated from the anterior vaginal wall as far downwards as is desired.

(7) The utero-sacral ligaments are divided, and the floor of Douglas' pouch and the anterior wall of the rectum are freed from the posterior vaginal wall.

(8) The lateral fornices of the vagina are freed from the base of the broad ligaments, and the vaginal wall is separated all round from the subjacent connective tissue.

(9) The uterus is then pushed downwards through the vaginal orifice, and the anterior and posterior flaps of peritoneum are sutured together above it.

(10) The opening in the abdomen is closed.

(11) The patient is placed in the dorsal gynæcological position, the uterus drawn further down by means of forceps applied to the cervix, and the vaginal vault is circularly divided as near the vulva as is desired, taking care not to wound the rectum or bladder.

(12) The cavity left above the remaining vaginal mucous membrane is plugged with iodoform gauze.

The operation, as described by Werder, is performed as follows:—The patient having been anæsthetised, the diseased part of the cervix is removed with a sharp curette and cauterised to stop hæmorrhage, if this step has not been taken some days previously. The abdomen is then opened, and the patient is placed in Trendelenburg's position. The ovarian vessels are tied as close to the brim of the pelvis as possible, and the round ligament is similarly treated. The peritoneum covering the anterior surface of the uterus is incised, and the bladder is pushed downwards off the uterus and also separated from the broad ligaments on each side as far as possible, in order to get the ureters out of the way. During this step the bases of the broad ligaments are exposed, and it is possible to trace the uterine arteries outwards

towards the pelvic wall, where they can be tied. If necessary, an assistant then passes two fingers into the vagina to act as guides,

FIG. 263.—Werder's hysterectomy.—A semi-diagrammatic illustration of the first step in Werder's operation. The appendages on both sides are liberated from their attachments as near the pelvic wall as possible, and the uterus is separated from the bladder anteriorly. The dissection is then carried down into the vaginal vault to within one or two centimetres of the outlet, as indicated by the arrows. Posteriorly, the vagina is freed from the rectum to within a short distance of the outlet. The diagram also shows the path followed in separating the vagina from the bladder and rectum. (*Cullen.*)

and the separation of the bladder from the anterior vaginal wall is carried downwards to within an inch or so of the vulva (*r*. Fig. 263). The utero-sacral ligaments are next divided with

FIG. 264.—Werder's hysterectomy. The uterus has been drawn strongly downwards by an assistant. The peritoneum from the anterior pelvic wall has been united with that of the rectum, thus shutting off the floor of the pelvis. *a* indicates the former attachment of *a'*; thus the area *a b* corresponds to *b a'*. (*Cullen.*)

scissors, the peritoneum covering the floor of Douglas' pouch is incised, and the rectum separated from the posterior vaginal wall to the same level as in the case of the bladder. This separation is carried round the vagina at each side to meet the anterior separation between the bladder and the vagina. The vagina now remains attached to the surrounding parts only by the base of the broad ligaments, which are very firmly united to the vaginal fornices. This separation is, according to Werder, the only really difficult part of the operation. As soon as it is accomplished, the uterus and vagina are pushed downwards through the vaginal orifice, and the anterior flap of peritoneum is sutured to the posterior flap. In this way, the peritoneal cavity is completely shut off from the retro-peritoneal cavity in which lies the displaced uterus (*v.* Fig. 264). The abdomen is then closed in the ordinary manner.

The final step of the operation consists in the removal of the uterus and a wide sleeve of vaginal mucous membrane. To do this, the patient is placed in the dorsal gynæcological position, and the uterus is seized with forceps and drawn completely outside the vagina. The positions of the bladder and rectum, relative to the inverted vagina, are then ascertained by passing a sound into the former and the finger into the latter, and the inverted vagina is amputated with the thermo-cautery or with a scalpel. A large raw cavity now exists above the remaining portion of the vaginal wall, and is bounded above by the peritoneum, in front by the bladder, and behind by the rectum. This is plugged loosely with iodoform gauze. It gradually contracts, and after a fortnight is almost completely obliterated.

If we prefer to adopt the technique of Kelly's radical hysterectomy, so far as the separation of the uterus and surrounding structures is concerned, there is nothing to prevent our doing so, while still retaining Werder's method of removing the separated uterus, etc., by the vagina. In such case, the first fourteen steps of Kelly's operation (*v.* page 434) are adopted, and then instead of clamping the vagina and removing it from above we adopt the last four steps of Werder's operation. In this way the advantages of both operations are obtained, and a more complete removal of the parametric structures and of the vagina is effected than can be effected by either method alone.

Complications.—The principal complications, which may occur during the performance of abdominal hysterectomy, are the

wounding of the bladder or the ureter, or the ligation of the latter while the uterine artery is being tied. Moreover, during the radical operation for cancer, the ureter may sometimes be so completely isolated as to slough subsequently. Wounds of the bladder can generally be easily closed. A ureter which has been divided must be re-united, implanted in the bladder, or brought out through the abdominal or vaginal wall, as is found most suitable. A ureter which has sloughed after operation cannot be repaired, and the only alternative to leaving the patient with a ureteral fistula is to extirpate the kidney of the same side. The rectal wall also may be damaged while opening into the vagina from the floor of Douglas' pouch, and the intestines may be injured during the separation of adhesions. In such cases, the tear must be immediately sutured.

After-treatment.—The after-treatment of ventral hysterectomy is similar to that of ventral cœliotomy (*v.* page 299).

VAGINAL HYSTERECTOMY.

Vaginal hysterectomy is the term applied to the removal of the uterus through the vagina.

Indications.—Vaginal hysterectomy is indicated in the following cases:—

(1) Certain cases of uterine myomata.
(2) Malignant disease of the uterus in a very early stage.
(3) Certain cases of bilateral suppuration of the uterine appendages.
(4) Certain cases of procidentia uteri.
(5) Certain cases of intractable uterine hæmorrhage.
(6) Irreducible chronic inversion of the uterus.

Instruments.—The following instruments are required in addition to those given under the head of vaginal cœliotomy (*v.* page 307):—four small and four large volsella (*v.* Figs. 9 and 232); two long spring clamps (Doyen's) (*v.* Fig. 265); ten clamps of Péan's and Segond's patterns with long, medium, and short serrated blades (*v.* Figs. 145, 266, and 267).

Operations.—The two principal methods of performing vaginal hysterectomy are:—

(I) Without mutilation of the uterus.
(II) With mutilation of the uterus.

(I) Without Mutilation of Uterus.—Vaginal extirpation of the unmutilated uterus, *i.e.* without preliminary incision or removal of any part of it, is the method indicated in all cases in which the size of the uterus, or the condition of the surrounding parts, does not prevent the uterus from being drawn down

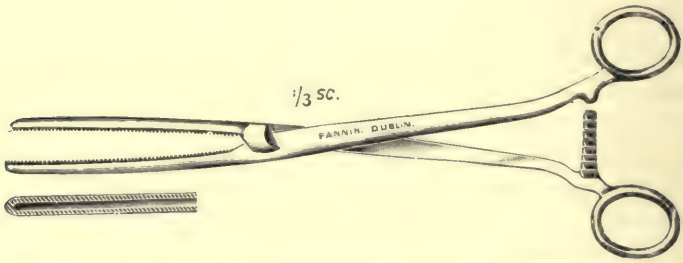


Fig. 265.—Doyen's broad ligament forceps with spring blades.

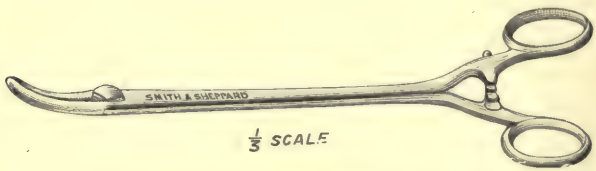


Fig. 266.—Segond's clamp forceps, curved blades.

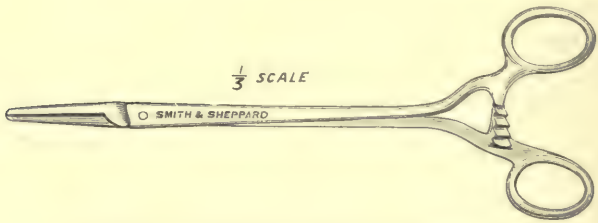


Fig. 267.—Segond's clamp forceps, straight blades.

through the vagina. It can be carried out by one of two methods' according to the means taken to ensure hæmostasis :—

(A) Hæmostasis by suture,—the "suture operation" (Czerny).

(B) Hæmostasis by clamp,—the "clamp operation" (Péan).

(A) **The "Suture Operation."**—The suture operation, the introduction of which is usually attributed to Czerny, is perhaps the most commonly adopted method of carrying out vaginal

hysterectomy. The various steps of the operation are as follows :—

(1) Preliminary disinfection of the field of operation, and the removal with the curette and the cautery of any projecting masses of malignant disease in the case of carcinoma of the cervix.

(2) The vaginal mucous membrane is incised round the cervico-vaginal junction.

(3) The bladder is pushed upwards off the uterus, and an opening is made into the peritoneal cavity through the bottom of the utero-vesical pouch of peritoneum.

(4) An opening is similarly made into Douglas' pouch through the posterior fornix.

(5) The utero-sacral ligaments are tied on each side and divided. This enables the cervix to be drawn further down.

(6) The cervix is drawn to the left, the base of the right broad ligament is tied, and the portion of ligament thus controlled is divided. A second stitch is then passed, to include the uterine artery, which is in turn divided.

(7) The base of the left broad ligament is similarly treated.

(8) The remaining portion of the right broad ligament is then drawn down, tied, and divided.

(9) The uterus is drawn down outside the vulva, and the remainder of the left broad ligament is tied and divided, and the uterus is removed.

(10) The ligatures which control the ligaments are drawn downwards, and the stumps of the ligaments are fixed to the divided edges of the vagina at their respective sides, by a suture which transfixes the stump and the vaginal mucous membrane.

(11) The anterior and posterior flaps of peritoneum are brought together with a catgut suture, as also are the anterior and posterior edges of the vaginal mucous membrane, and a gauze tampon is placed in the vagina. In the presence of pelvic suppuration, the stitching of the peritoneum and vaginal mucous membrane must be omitted, and instead a gauze drain placed in the pelvis (*v.* Fig. 143).

The operation is performed as follows :—If the indication for the operation is malignant disease of the vaginal portion of the uterus, all malignant masses must first be curetted away and the cavity thus formed well cauterised with the thermo-cautery. It may be also further disinfected by swabbing out with pure

formalin. Three stout silk ligatures are then passed through the anterior and posterior lips so as to close the cervical canal, and at the same time afford a means of applying traction to the uterus. The operator, holding these sutures in one hand, incises the vaginal mucous membrane round the cervix at the level of the cervico-vaginal junction (*v.* Fig. 268).

Then, as in a vaginal cœliotomy, the bladder is pushed up in

FIG. 268.

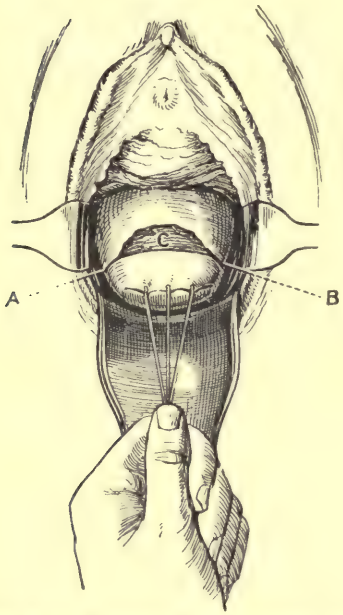


FIG. 269.

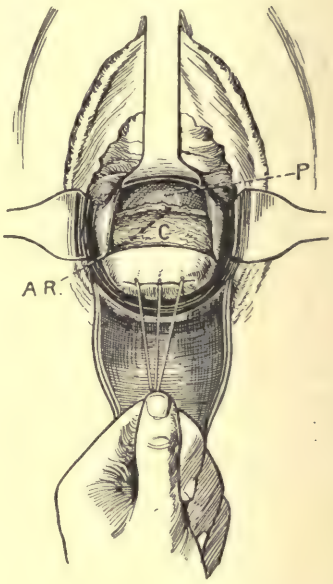


FIG. 268.—Vaginal hysterectomy. An incision A, B, has been made round the anterior aspect of the cervix. C. Exposed cervical tissue.

FIG. 269.—Vaginal hysterectomy. The bladder has been pushed up, and the peritoneal reflexion exposed and opened. C. Exposed cervical tissue. A.R. Cut edge of peritoneum. P. Peritoneum covering anterior wall of uterus.

front and the anterior pouch of peritoneum exposed and opened, and similarly posteriorly an opening is made into Douglas' pouch (*v.* Figs. 269, 270). It is most important that the bladder should be pushed up not only in front, but at the sides, as by so doing the ureters are also pushed upwards and carried away from the para-cervical region. In this way, the risk of subsequent injury to them is avoided.

The operator then passes a finger into Douglas' pouch and

hooks down the utero-sacral ligament on one side. A silk ligature is passed round it with a pedicle needle, and the ligament tied about half an inch or so above its insertion into the cervix and divided. The opposite ligament is then similarly treated. The division of these ligaments materially facilitates the drawing down of the cervix, and renders the remaining steps of the operation more easy.

FIG. 270.

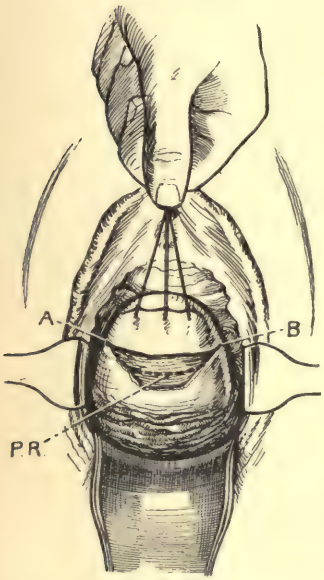


FIG. 271.

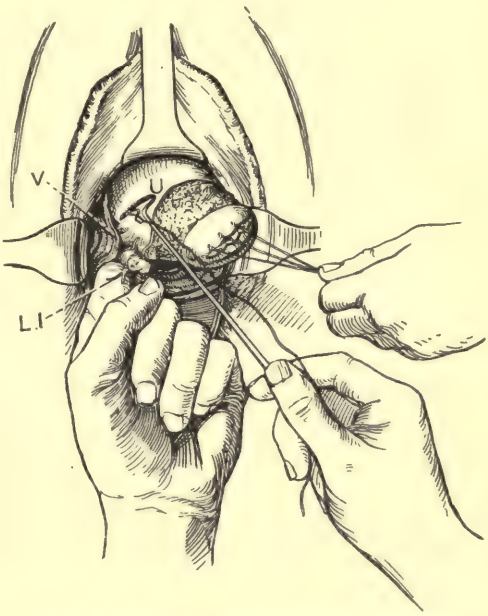


FIG. 270.—Vaginal hysterectomy. An incision A, B, has been made round the posterior aspect of the cervix, and the posterior peritoneal reflexion P.R. exposed.

FIG. 271.—The uterus is drawn over towards the operator's right, and one suture, L. 1, has been placed on the base of the right broad ligament. A second suture is in process of being applied. V. Vaginal mucous membrane. U. Uterus.

The cervical sutures are then given to an assistant who draws them towards the patient's left side, in such a manner as to expose the base of the right broad ligament. A silk suture is passed with the pedicle needle through the base of the ligament at the distance of a centimetre from the uterus, and in such a manner as to include a portion of ligament a centimetre in diameter. This suture is tied tightly, and the portion of ligament controlled by it is divided as close to the uterus as possible. A second suture is then passed in a similar manner through the base of the undivided

portion of the ligament, tied, and the controlled portion cut (*v.* Fig. 271). If this ligature includes the uterine artery we turn our attention to the opposite side ; if it does not, another ligature is passed above the first, and it will include the vessel. The base of the left broad ligament is next tied in a similar manner, and divided.

The uterus can now be drawn further downwards, and, if the

FIG. 272.

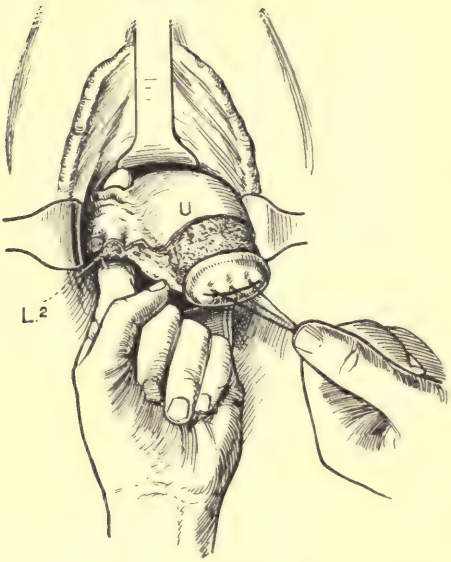


FIG. 273.

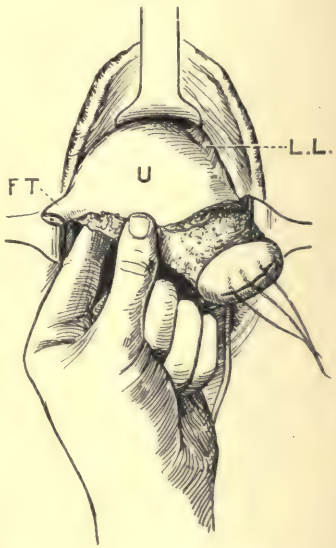


FIG. 272.—Vaginal hysterectomy. The second ligature, L. 2, on the broad ligament has been tied, and the finger passed above the free edge of the ligament in order to hook it down for the insertion of the last ligature.

FIG. 273.—Vaginal hysterectomy. The right broad ligament has been tied and divided, and the uterus is being drawn over to the operator's left to expose the left broad ligament. F.T. Uterine end of Fallopian tube. U. Uterus. L.L. Left broad ligament.

finger is passed through the posterior opening in the peritoneum, the top of the broad ligament on the right side can be pulled down by hooking the finger over it (*v.* 272). If it is desired to remove the ovary and the tube as well, they can be drawn down in a similar manner after first separating any adhesions which may hold them. The remaining portion of broad ligament on the right side is then tied off, with one or two sutures as necessary, and divided, the ligatures being passed inside or outside

the ovary as is required. As soon as this is done, the uterus can be drawn down outside the vulva, and its remaining attachment, *i.e.* the upper half of the left broad ligament, tied and divided (*v.* Fig. 273). If there is still any hæmorrhage, it is probably due to small vessels in the vaginal walls, or to the slipping of a ligature. As soon as it has been checked, the ligatures attached to the cut ends of the ligaments are separated, so as to correspond with the sides to which they belong, and the cut end of each broad ligament is in turn drawn down and fixed, by a suture passed with a medium-sized sharp needle, to the

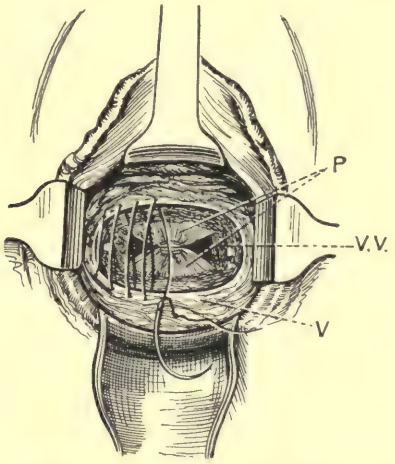


FIG. 274.—Vaginal hysterectomy. The uterus has been removed, and the anterior and posterior flaps of peritoneum (P) brought together by a catgut suture. The vaginal edges are in process of being similarly brought together. V.V Uterine vessels. V. Vaginal mucous membrane.

corresponding side of the vaginal opening. If the ovaries have been removed, the ligatures on the ovarian vessels should be cut off short and not drawn down, as traction on them might cause them to slip. Finally, the anterior and posterior flaps of peritoneum are brought together by means of a few catgut sutures (*v.* Fig. 274), and the cut edges of the vagina are similarly treated. If any pus-containing cavities are opened in the course of the operation, it is better not to close the peritoneum or vagina, but rather to plug the pelvic cavity with iodoform gauze, the ends of which are brought down into the vagina (*v.* page 297).

If the body of the uterus is free, it is often advantageous to

apply the ligatures from above downwards instead of from below upwards. With that object, as soon as the utero-vesical pouch is opened, the fundus is extracted through it, as has been described already (*v.* page 313 and Fig. 159) under the head of Vaginal Cœliotomy. The first ligature is then so applied as to include the uterine ends of the tube and round ligament and the ovarian ligament on the left side. These structures are then divided. The remainder of the ligament is next tied from above

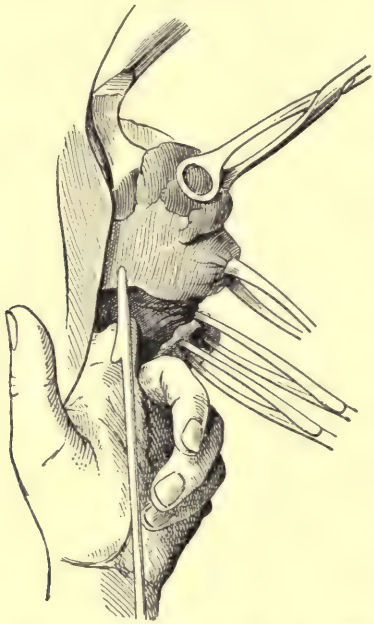


FIG. 275.—The application of the first clamp on the broad ligament in vaginal hysterectomy—clamp operation. (*Landau.*)

downwards, and divided. Lastly, the base of the ligament and the uterine artery are tied. The uterus, which is now attached by the right broad ligament above, is then drawn down and this ligament tied and divided in a similar manner.

(B) **The "Clamp Operation."**—The use of clamps instead of sutures to ensure hæmostasis was introduced by Péan and Richelot. The following advantages are claimed for this method of controlling the vessels (Landau) :—

(1) The use of clamps shortens the operation.

(2) The clamps afford a handle by which the ends of the

ligaments can be drawn down for inspection, and they subsequently keep these ends in an extra-peritoneal position.

(3) The clamps act as a drain by keeping the vaginal walls apart.

The first steps of the operation, up to and including the opening of the utero-vesical and Douglas' pouches, are similar to those of the suture operation. The main points of difference then show themselves :—If the uterus is free from adhesions, the fundus, and the ovaries and tubes if necessary, may be brought out through the opening in the anterior vaginal vault before any clamps are applied. The clamps are then applied, starting either below or

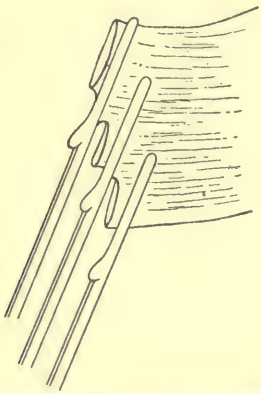


FIG. 276.—Diagram of the manner in which the broad ligament is controlled by clamps in vaginal hysterectomy. (*Landau.*)

above as is thought best. If their application is commenced below, the first step is the clamping of the utero-sacral ligaments by two clamps, one on each ligament half an inch above its insertion into the cervix. The ligaments are then divided. The cervix is then drawn well over to the left, and a clamp with short or medium jaws applied so as to include the base of the broad ligament and the uterine artery (*v.* Fig. 275). This portion is then divided at the uterine side of the clamp, and another clamp is placed at a higher level as in the case of the sutures. The controlled piece is in turn divided, and another clamp applied still higher. In this way the whole of one side is clamped and divided (*v.* Fig. 276). When dividing the ligament, the incision should be kept as close to the uterus as possible so as to leave

some tissue beyond the clamp. The opposite ligament is next clamped and divided, in a similar manner. In some cases, it may be found sufficient to use one long clamp, applied over the entire height of the ligament after the utero-sacral ligaments have been clamped and divided. If this is done, another lighter clamp must be placed outside it as an additional protection. The objection to a single clamp is that it is difficult to get uniform pressure on the entire ligament in this way, and that, consequently, a portion of the ligament may subsequently retract from the grip of the clamp and bleed.

If the uterus is so fixed, owing to the existence of malignant or inflammatory disease, that it cannot be pulled down and extroverted through the anterior incision, the clamps must be applied before the uterus is brought down externally, just as the ligatures are applied in the suture operation. Finally, a light tampon of iodoform gauze is passed into the vagina, and a part of it is introduced into the pelvic cavity if there has been any escape of septic matter.

(II) With Mutilation of the Uterus.—Vaginal extirpation of the uterus in a mutilated condition is indicated when the size of the organ, or the condition of the appendages, prevents its delivery through the vagina in one piece. It is usually necessary in the presence of myomata, or of suppurative conditions of the adnexa. Uterine enlargement due to malignant disease is a contra-indication to this method, as the opening of the uterine cavity would probably cause the dissemination of infection. There are so many different operations for the vaginal removal of an enlarged uterus that it would be impossible to go into all of them in detail. A very concise description of them will be found in Landau's "Radical Vaginal Operation." Here, it is only possible to give a short note on the most important.

The operation can be carried out by the following methods:—

(1) By median incision of the anterior (Doyen) or both (Quénu, Müller) uterine walls.

(2) By morcellation with V-, Y-, or disc-shaped incisions of the anterior wall (Doyen).

The object of all these operations, and of others of the same kind, is to make it possible to bring down through the vagina an uterus which otherwise would be too large or too fixed in its

position to allow such a course. In Doyen's operation of sagittal median incision of the anterior wall, the object is to enable the uterus to open out—so to speak, and so by diminishing its antero-posterior diameter to allow the fundus to be brought out through the opening in the anterior cul-de-sac (*v.* Fig. 277). In Quénu and Müller's operation, the uterus is divided sagittally in the mesial line into halves, each of which is brought down separately (*v.* Fig. 278). In both these operations, hæmostasis, either by clamp or by ligature, is secondary or consecutive; that

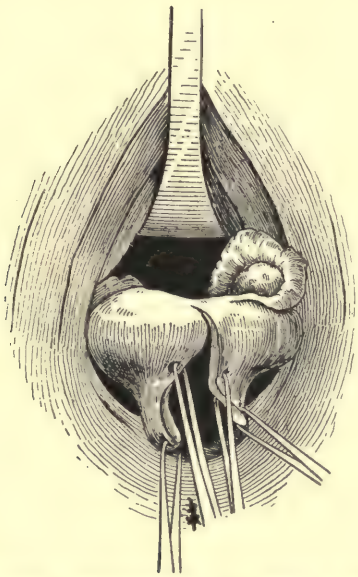


FIG. 277.—Doyen's vaginal hysterectomy, by median incision of the anterior uterine wall. (*Labadie-Lagrave.*)

is to say, it is not performed until the uterus and appendages have been brought down outside the vagina. Both Doyen's and the Quénu-Müller operations are most suited to cases in which there is suppurative disease of the adnexa; the latter operation being the more suited to those cases in which the appendages are of large size.

Doyen's operation of morcellation consists in removing the anterior wall of the uterus piecemeal. Hæmostasis is secondary. The operation is intended for myomata which cannot be enucleated in such a manner as to leave the uterus functionally perfect, and

which do not reach above the umbilicus. It is a tedious operation, and one which is now seldom performed on account of the

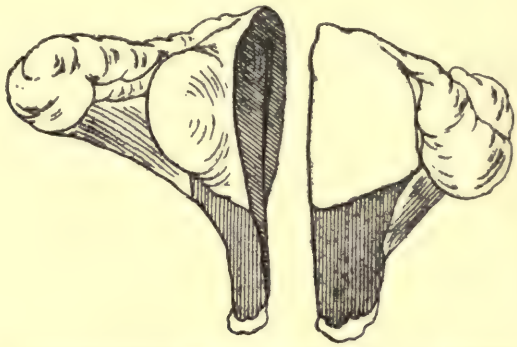


FIG. 278.—Quénu-Müller's vaginal hysterectomy, by complete median incision of the uterus. (*Labadie-Lagrave.*)

improvements in, and consequent better results of, ventral hysterectomy. The accompanying diagram will give a general

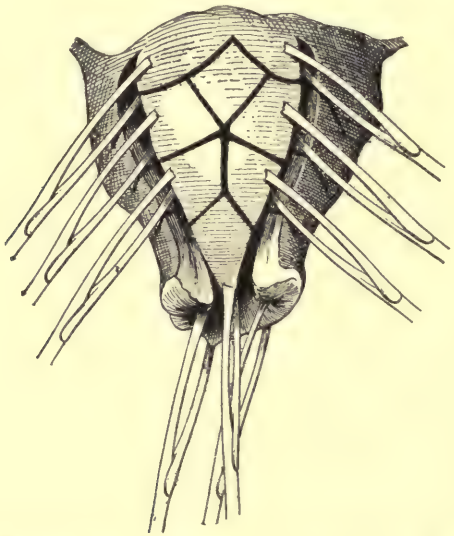


FIG. 279.—Doyen's vaginal hysterectomy, by morcellation. Scheme of the manner in which the fragments are removed. (*Landau.*)

idea of the manner in which the uterine wall is incised and removed (*v.* Fig. 279).

Complications.—The complication which is most likely to

occur in vaginal, as in ventral hysterectomy, is wounding of the ureters, bladder, or rectum. The careful separation and upward displacement of the bladder, as a preliminary to the ligation and division of the bases of the broad ligaments, is the best mode of preventing injury to the ureter or bladder. The rectum is most liable to be injured while Douglas' pouch is being opened, or while firmly adherent appendages are being enucleated.

After-treatment.—The after-treatment is similar to that of vaginal cœliotomy (*v.* page 318).

MYOMECTOMY AND ENUCLEATION.

By the term myomectomy (μῦς, muscle; ἐκτομή, a cutting out) is meant the excision of a pedunculated myoma by cutting across the pedicle; and by enucleation, the shelling out of its bed

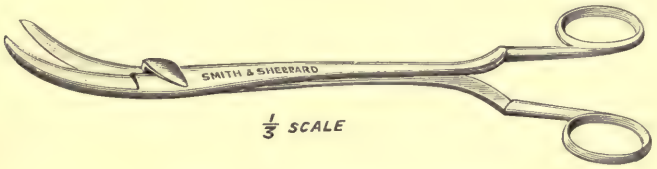


FIG. 280.—Long double-curved scissors.

of a sessile or interstitial myoma. Here, we are only concerned with these operations when they are adopted with the object of removing interstitial or subserous myomata. The removal of submucous myomata has been already discussed (*v.* page 403).

Indications.—One or other of these operations is indicated, according to the nature of the tumour, in all cases in which a myoma is causing so marked symptoms as to require its removal, or in which it is obviously increasing in size, and in which its removal is possible without the performance of hysterectomy.

Instruments.—The instruments mentioned under the head of ventral or vaginal cœliotomy are all that are required (*v.* pages 285, 307), with the addition of a pair of long double-curved scissors (*v.* Fig. 280).

Operations.—The two operations must be discussed separately.

Myomectomy.—The operation of myomectomy is usually quite simple. It can be performed by the vaginal route, if the tumour is sufficiently small to be brought either entire or in fragments

through an opening in one or other of the vaginal fornices. If the myoma is too large for this, the abdominal route is chosen, and in most cases it is the most satisfactory route. Whatever route is selected the peritoneal cavity is opened, and the tumour drawn out through the wound. If the pedicle is long and thin, it is first caught in a clamp forceps, and then cut across above the forceps. The clamp is then loosened, and any bleeding vessels are caught with clip forceps and tied with mattress sutures of silk

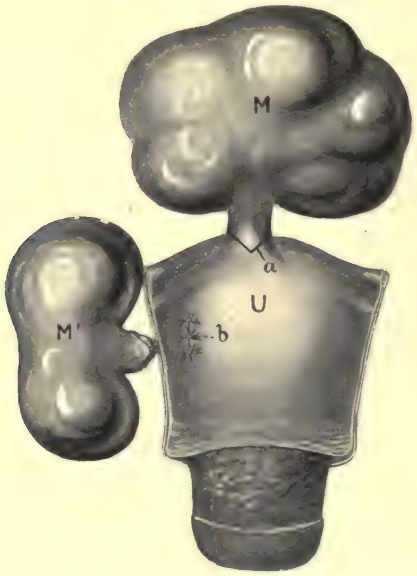


FIG. 281.—Myomectomy in the case of a pedunculated sub-peritoneal myoma. M. Myoma. *a*. Site of incision. M'. Myoma removed from *b*, which has been closed by sutures.

passed through the stump. Lastly, the peritoneum is brought together over the stump with a catgut suture.

Another method, which usually answers best when the pedicle is fairly thick, consists in amputating the tumour by two incisions, so made as to leave a wedge-shaped cavity (*v*. Fig. 281). The edges of this cavity are then closed with a few silk or catgut sutures.

If the tumour is attached by a broad base, the first point is to determine the line of demarcation between it and the uterus. The peritoneum is then incised round the tumour about an inch above this line, and is stripped down off the tumour in order to

give a flap for covering subsequently the site of the tumour. The tumour is then separated at the line of demarcation, and any bleeding vessels are caught and tied. If the bleeding cannot be checked in this manner, deep sutures of silk are passed at right angles to the incision and tied, and also mattress sutures so passed as to include the bleeding spot. Lastly, the peritoneum is brought together over the site. Finally, the uterus is returned to the abdomen, and the wound closed.

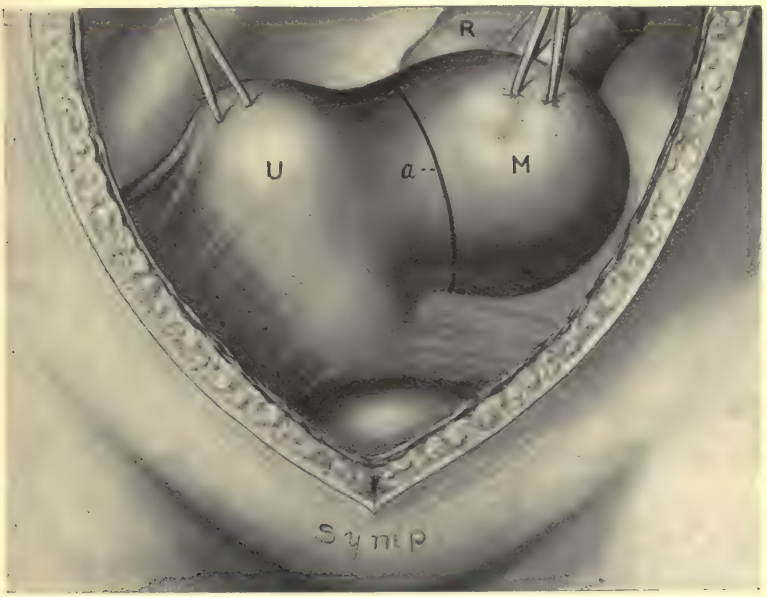


FIG. 282.—Enucleation of myoma. U. Uterus. M. Myoma. *a*. Site of incision through capsule. R. Rectum.

Enucleation.—Enucleation is a more troublesome operation as far as hæmostasis is concerned. Like myomectomy, it can be performed by the vaginal, in the case of small, or by the abdominal route in the case of large tumours. In the case of a small tumour, an incision is made through its capsule, the growth shelled out with the handle of the scalpel, or with a blunt knife, and the cavity closed by interrupted silk or catgut sutures. In the case of larger tumours, temporary hæmostasis may sometimes have to be obtained by getting an assistant to grasp the lower segment of the uterus firmly in his hands, or by placing a gauze

band round the lower segment and twisting the ends of the band so as to make it tight. An incision is then made through the peritoneum a little above the line of junction of tumour and uterus (*v.* Fig. 282), and the peritoneum is stripped down. The capsule is then incised, and the tumour shelled out (*v.* Fig. 283). If the uterine cavity is opened, it may be advisable to pass a drain from the bed of the myoma into it before closing the uterine wall and peritoneum, but as a rule this is unnecessary. The objection to

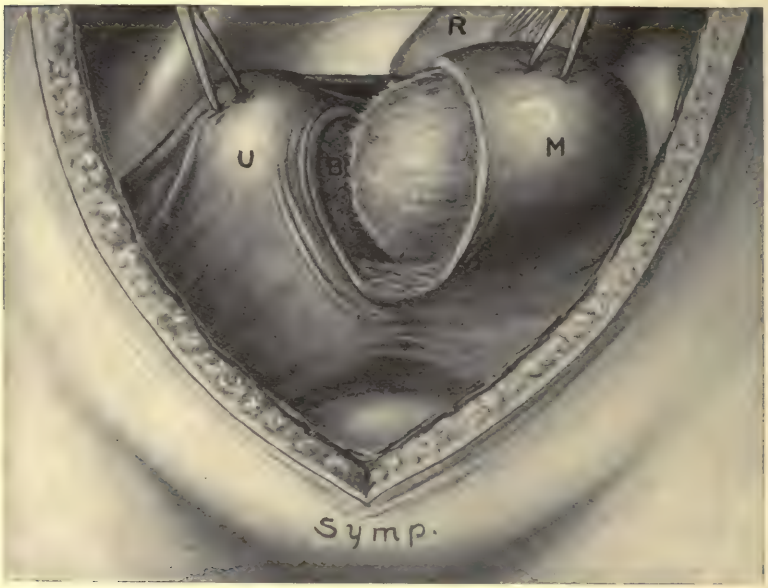


FIG. 283.—Enucleation of myoma. The capsule has been divided and the myoma separated from its bed. U. Uterus. M. Myoma. B. Bed of myoma. R. Rectum.

enucleation is the difficulty of checking hæmorrhage. Bleeding vessels can be picked up and tied, but general oozing from the walls of the cavity left by the removed myoma is sometimes difficult to control. If the cavity is not too deep, we are in the habit of checking oozing by mattress sutures as shown (*v.* Fig. 284). The edges of the incision are then brought together by a continuous suture.

Enucleation is an ideal proceeding for the removal of interstitial myomata, as it usually leaves the uterus functionally

perfect. Unfortunately, the number of cases in which it can be carried out is not very great.

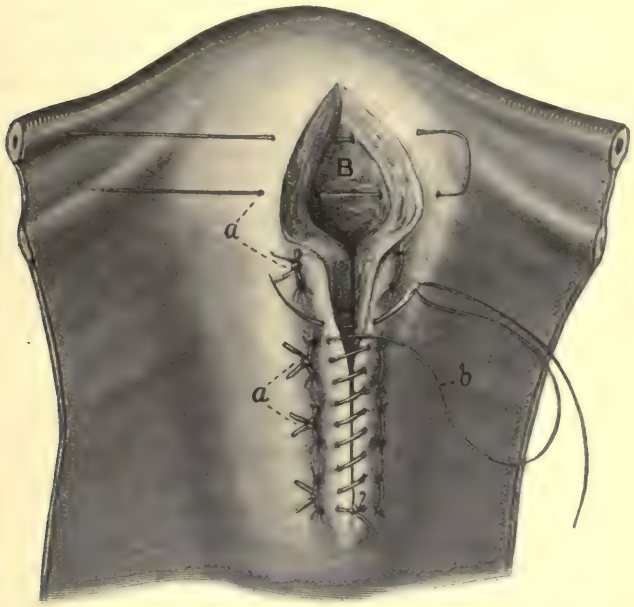


FIG. 284.—Enucleation of myoma. Method of closing the cavity left in uterine wall. *a*, *a*. Mattress sutures controlling the hæmorrhage. *b*. Continuous suture bringing together edges of wound. B. Bed of myoma.

After-treatment.—The after-treatment is similar to that of ventral or vaginal cœliotomy, as the case may be (*v.* pages 299, 318).

HYSTEROPEXY.

Hysteropexy (ὑστέρα, the womb; πῆξις, a fastening) is the term applied to the fixation of the uterus to the abdominal or vaginal wall with the object of correcting a malposition.

Indications.—Hysteropexy is indicated under the following conditions:—

(1) In backward displacements of the uterus which give rise to symptoms, and in which—(*a*) a pessary cannot be found which will keep the uterus in place; (*b*) the wearing of a pessary is associated with continual discomfort, or with the occurrence of vaginitis; (*c*) the patient lives under circumstances which preclude

her from obtaining the necessary periodical medical advice.

(2) In descent of the uterus due to laxity of its ligaments, rather than to lesions of the pelvic floor, when a pessary is unsuitable for the reasons given above.

(3) After operations on the appendages or the uterus, as a result of which it is probable that a displacement will occur if the uterus is left free.

Instruments.—Similar instruments are required as for ventral or vaginal cœliotomy (*v.* pages 285, 307).

Operations.—The uterus may be sutured to the abdominal or vaginal walls, and accordingly there are two classes of operation :—

(A) Ventral hysteropexy.

(B) Vaginal hysteropexy.

(A) **Ventral Hysteropexy.**—Ventral hysteropexy consists in suturing the fundus of the uterus to some portion of the abdominal wall in the median line. The term *ventral suspension* is applied to the operation when the fundus is fixed to the peritoneum of the abdominal wall in such a manner that it gradually draws out a band of peritoneum, which constitutes a new ligament, as it were, and which enables the uterus to preserve its normal mobility almost unimpaired. The term *ventral fixation* is applied to the operation when the fundus is fixed to the rectus muscle or to the fascia in such a manner that a permanent and inelastic bond of union results. Ventral fixation may give rise to trouble during pregnancy and labour as a result of this non-yielding union, and therefore it is only permissible in women who are past the child-bearing period. In all other cases, ventral suspension is indicated. In both operations, the first step consists in opening the abdomen in the middle line, immediately above the symphysis, and freeing the uterus, if it is held by adhesions. The remaining steps differ according to the particular form of operation adopted.

The method, which we usually adopt, of performing ventral suspension is that devised by Kelly. In this method, the sutures are passed through the peritoneum alone of the abdominal wall, and through the posterior wall of the uterus just below the fundus. The steps of this operation are as follows :—

(1) The bladder is emptied with a catheter, and the abdomen

is opened in the middle line by an incision of two or three inches in length, ending three-quarters of an inch above the symphysis.

(2) The index and middle fingers are passed into the peritoneal cavity and down to the fundus, and any adhesions affecting the latter or the appendages are separated. Two fingers are then passed behind the uterus, and the latter is drawn upwards until

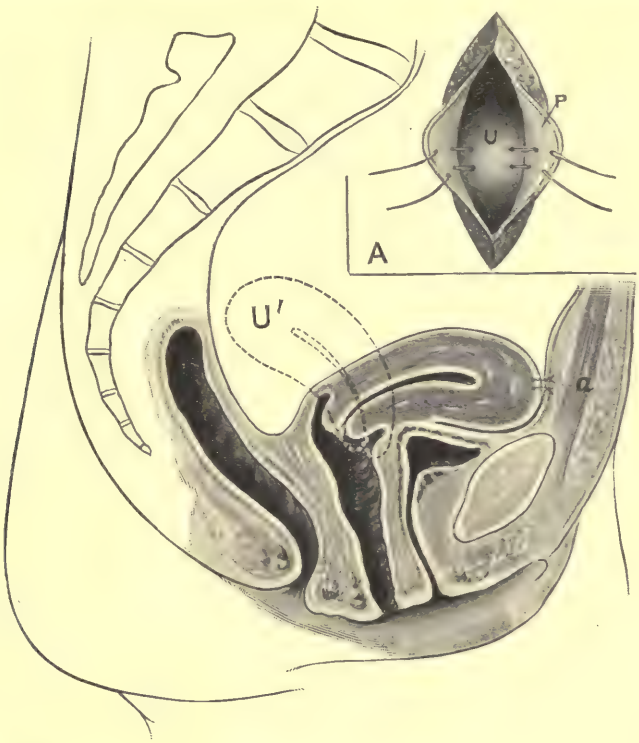


FIG. 285.—Kelly's ventral suspension. The position of the uterus after fixation has been performed. U'. The position prior to operation. A. The method of inserting the sutures. P. Peritoneum. U. Uterus.

the fundus lies behind the symphysis. If desired, the special elevators designed by Kelly for this purpose may be used. It is, however, simpler to catch the fundus with a bullet forceps and draw it up to the incision. If the forceps are applied at the exact spot through which we intend to pass the sutures, the punctures made by the points are of no importance, as any tendency to bleed will be checked by the pressure of the sutures.

(3) The edges of peritoneum are caught in a clip forceps at

both sides of the wound, and are drawn outwards. A small curved needle, threaded with a silk suture, is then entered on the inner surface of the peritoneum about a centimetre from the edge, and as near as possible to the lower end of the incision. It traverses the peritoneum and the extra-peritoneal fatty tissue, and again emerges on the inner surface, including about a centimetre

FIG. 286.—Olshausen's ventral suspension of the uterus. P. Peritoneum. R. Round ligaments. T. Tubes. O. Ovaries.

of peritoneum. It is then passed through the posterior surface of the uterus in the middle line, one or two centimetres below an imaginary line drawn between the uterine insertion of the tubes. It includes a piece of uterine tissue about a centimetre in width and a quarter to half a centimetre in depth. On emerging from the uterus, it finally traverses the peritoneum at the opposite side of the incision, at a corresponding point to, but in the

reverse manner, to that in which it was entered (*v.* Fig. 285, A). This suture is drawn tight, taking care that a piece of intestine is not included between it and the uterus, and is tied. A second suture is then introduced. It passes through the peritoneum in a similar manner to and about a centimetre above the first suture, and through the posterior uterine wall a centimetre below it (*v.* Fig. 285).

(4) The omentum is drawn down, a careful examination is made to see that a loop of intestine has not been caught in the loop of a suture or below the uterus, and the abdominal wound is closed in the usual manner.

Kelly considers that as the adhesions which are thus formed between the uterus and the peritoneum stretch, a more normal position of the uterus results than is the case when the fundus or the anterior surface of the uterus is sutured to the abdominal wall. We have discussed elsewhere the effect of pregnancy upon the adhesions (*v.* page 104).

The other method of performing ventral suspension, which we consider of most value, is that recommended by Olshausen, who sutures the round ligaments, at their points of emergence from the uterus, to the parietal peritoneum at points about an inch to each side of the median incision in the latter. The nature of the operation will be seen from the drawing (*v.* Fig. 286).

The original method of ventral fixation consisted in passing two or three silk or silkworm-gut sutures through the entire thickness of the abdominal wall at the lower end of the initial incision, then fairly deeply, transversely, through the fundus of the uterus, and out through the opposite abdominal wall. The sutures should be about a centimetre apart, and the lowest is passed first and tied before the others are inserted. This operation has been improved by various operators and modified in several ways, of which one of the best is that recommended by Kelly. He opens the sheath of the recti muscles and exposes the fibres. He then passes a stitch through the rectus about a centimetre from its inner edge, then through the fundus of the uterus, and then through the opposite rectus at a point corresponding to the entrance of the suture. A second, and if necessary a third, suture are then passed above the first. As a preliminary, he scarifies the peritoneum of the fundus between the sutures so as to facilitate its union with the muscle.

Kocher also has devised an operation which is still more radical. In this method the uterus is drawn partially out through the abdominal incision, and the edges of the peritoneum are sutured to the fundus in such a manner as to leave uncovered the entire top of the uterus (*v.* Fig. 287, A). Two fixation sutures are then passed which traverse the rectus fascia at each side and pass deeply into

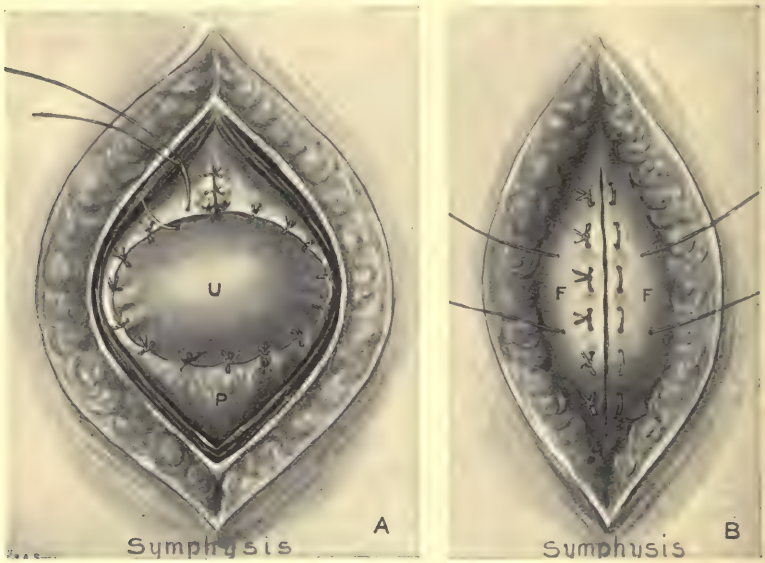


FIG. 287.—Kocher's ventral fixation of the uterus. A. Suture of the fundus of the uterus to the peritoneum. B. The fascia closed with mattress sutures, two fixation sutures (shown untied) in position. U. Uterus. P. Peritoneum. F. Fascia.

the muscle of the fundus. The fascia is then brought together in the usual manner (*v.* Fig. 287, B), the fixation sutures are tied, and the remainder of the incision closed. By this means, a large area of the uterus is brought into close contact with the recti muscles and the fascia.

(B) **Vaginal Hysteropexy.**—Vaginal hysteropexy consists in suturing the uterus to the anterior vaginal wall, or in some cases to the bladder. The initial steps of the operation are similar to those described under the head of vaginal cœliotomy (*v.* page 309). The uterus is then freed from adhesions, and brought forward into the opening in the anterior vaginal vault. Three silkworm-gut sutures are used to fasten it in this position. They are entered

through the vaginal flap at one side, then passed through the peritoneum at the same side, then through the middle of the anterior surface of the uterus, and then through the peritoneum and vaginal flap of the opposite side. The sutures should traverse the uterus just sufficiently above the level of the uterine isthmus to keep the fundus forwards (*v.* Fig. 288), and their exact position

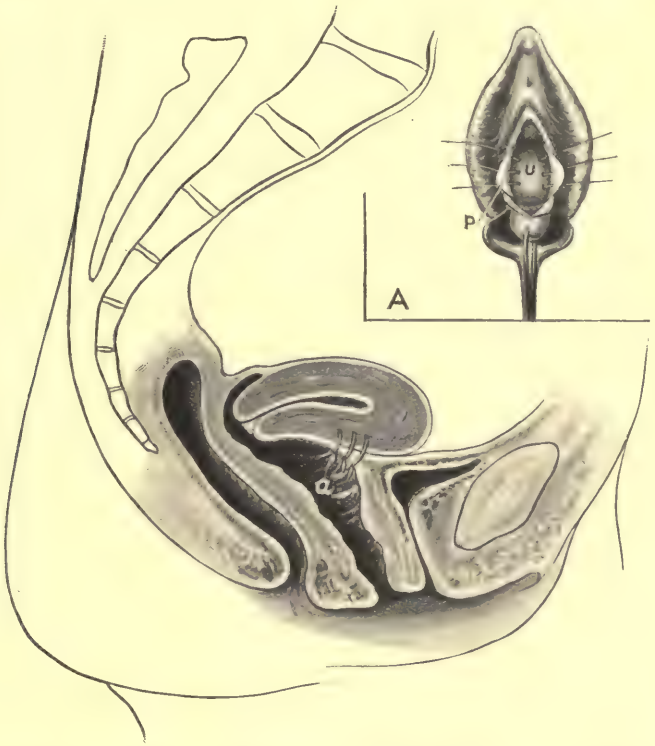


FIG. 288.—Vaginal hysteropexy. The fixation sutures in position.
U. Uterus. *a*. Sutures. A. The method of inserting the sutures.
P. Peritoneum.

depends upon the size and length of the uterus. The heavier and the longer the uterus, the higher the sutures must be passed through the anterior uterine wall. It is a mistake to pass them higher in the body than is necessary, as, the higher they are situated, the more the normal degree of mobility of the uterus is interfered with. The sutures are passed about a centimetre apart, and should not be tied until the vaginal wound has been united by a continuous catgut suture.

The main objection to this form of vaginal hysteropexy is the resulting interference with uterine mobility and the possibility of consequent trouble during pregnancy and labour, if the sutures are passed high up on the uterine body. On the other hand, if the sutures are not passed sufficiently high, the fundus is still free to fall back, dragging with it the upper part of the vagina. In performing the operation, we are thus between the Scylla of fixing the uterus at too high a point and having subsequent trouble from its immobility, and the Charybdis of fixing it at too low a point and having consequent failure of the operation. For this reason we have abandoned the operation, save in cases in which we are performing colporrhaphy, and in which there is no objection to the fixation of the fundus, as in cases of prolapse in women who are past the child-bearing period. In these cases it is most successful, but for other cases we prefer the operation described by Vineberg (*v.* page 471).

The foregoing operation of fundal vaginal fixation, which was originated by Mackenrodt, was subsequently given up by him for an operation which he terms vesico-fixation. It consists of the following steps :—

(1) Longitudinal incision of the vagina, and dissection of the vaginal walls laterally off the bladder.

(2) Stripping the bladder off the uterus, and opening of the utero-vesical pouch.

(3) Suture of the peritoneum, which covers the bladder, to the fundus of the uterus.

(4) Fixation, level by level, of the bladder wall, which has been stripped from the cervix, to the body of the uterus down to the level of the os internum.

(5) Suture of the vaginal incision, as in colporrhaphy.

Mackenrodt claims that this operation brings the uterus into a normal position, while at the same time it permits all necessary freedom of movement.

Dührssen formerly operated through a transverse incision at the junction of the anterior vaginal wall and the cervix, and fixed the uterus by two silkworm-gut sutures passed sagittally through the vaginal walls and the fundus. This proceeding tended to bring the uterus into a position of too great anteflexion, and consequently gave rise to very serious trouble during pregnancy and labour.

To avoid these troubles he modified his technique. He now opens the vaginal fornix by a ⊥-shaped incision, very similar to Mackenrodt's incision, and then opens the peritoneum sagittally. One fixation suture is then passed through the vagina and the peritoneum, near the upper end of the peritoneal opening, and then through the uterus. Before it is tied, the cut edges of peritoneum are closed by a continuous catgut suture, then the fixation stitch is tied, and the vaginal wound is closed in the ordinary manner. In this way, the peritoneum covering the fundus forms a purely sero-serous union with the peritoneum which has been stripped off the bladder, and this union stretches during pregnancy.

It is quite possible that either of these modified operations of Mackenrodt or Dührssen will be successful in cases in which the pelvic muscles are in their normal state. If, however, this is not the case, and there is any tendency to prolapse, we find it difficult to believe that the uterus would not quickly drop into a vertical position, and then into retroposition, dragging with it the bladder. For this reason, we prefer Vineberg's operation in those cases in which fundal fixation is contra-indicated, and in which we desire to operate through the vagina. The essential difference between this operation and the preceding operations is that, instead of fixing the body of the uterus, we fix the round ligaments. It is thus analogous to Olshausen's operation of ventral suspension.

Vineberg first performs an anterior colpotomy (*v.* page 309), and then fixes the round ligaments to the vaginal flaps. The initial steps of the operation are identical with those of Mackenrodt's operation of vaginal fixation, up to the stage at which the peritoneum is incised and the anterior surface of the uterus exposed. A finger is then hooked behind the broad ligament on one side, and the corresponding tube and round ligament are drawn down into the vaginal opening. A fixation suture is passed behind the round ligament from above downwards, and about an inch or an inch and a half from the uterine insertion of the ligament. In addition to including the round ligament, it also includes a portion of the broad ligament immediately behind the latter. A second fixation suture is then passed in a similar manner half an inch nearer the uterus.

The opposite broad ligament is then hooked down, and sutures

are passed behind the round ligament as has been described. The peritoneal covering of the ligaments, at points corresponding to the sutures, are then vivified by lightly scraping them with a scalpel, and the fixation sutures are carried through the vaginal flap on the side to which each belongs, at a point corresponding to the lateral vaginal sulci, and as near the pubic arch as possible. The suture which lies highest on the round ligament is passed nearest the pubis, and the lower suture a little beneath it. The peritoneal and vaginal incisions are then closed as has been already described (*v.* page 315). Lastly, the fixation sutures are tied, taking care that whilst doing so the fundus of the uterus is in apposition with the anterior vaginal wall.

If the uterus is very large, and if there is any reason to fear that fixation of the ligaments will be insufficient, a uterine fixation stitch may also be passed in the usual manner. It traverses the uterus at a point midway between the fundus and the os internum.

After-treatment.—The after-treatment of these cases is similar to that of ventral or vaginal cœliotomy as the case may be (*v.* pages 299, 318). During the first four or five days, the catheter should be passed every four hours, if the patient cannot empty the bladder of her own accord, to prevent any undue pressure on the uterus by a distended bladder. In the abdominal operation, the sutures are buried, and are not removed, while in the vaginal operation the fixation sutures are taken out, as a rule, in three weeks. The patient should not be allowed out of bed for at least fourteen days, and a longer time is advisable if the uterus is of large size.

RADICAL CURE OF INVERSION OF THE UTERUS.

The only operation, which it is necessary to describe under this heading, is that originated by Küstner. It consists in performing a posterior colpotomy, and then dividing the constricting isthmus of the uterus, to permit the pushing up of the body.

Indications.—Küstner's operation is indicated in the case of inversion of the uterus occurring in women who have not reached the menopause, when less radical measures have failed (*v.* page 118).

Instruments.—The instruments required are mentioned under the head of Vaginal Cœliotomy (*v.* page 307).

Operation.—The various steps of the operation are as follows :—

(1) Douglas' pouch is opened by means of a wide transverse incision through the posterior fornix.

(2) The index finger is introduced through the opening into the funnel of the inverted uterus, and any adhesions present are detached.

(3) A longitudinal incision is made through the posterior uterine wall, in the middle line, starting two centimetres above the *inverted* fundus, and finishing two centimetres from the os externum. This incision extends completely through the uterine wall, with the exception of the peritoneum.

(4) The constricting funnel is fixed by the index finger in Douglas' pouch, and the uterus is replaced by pushing up the fundus with the thumb of the same hand.

(5) The uterine incision is closed by deep and superficial sutures passed from the peritoneal surface, and the openings in Douglas' pouch and the vaginal wall are brought together by continuous catgut sutures.

(6) The uterine cavity is firmly plugged with iodoform gauze, and a light plug of the same material is placed in the vagina.

After-treatment.—The after-treatment is similar to that of a vaginal cœliotomy. The gauze must be removed on the next day, or the day following. If there is any tendency to the recurrence of the inversion, the uterine cavity should be plugged again. The administration of ergot is perhaps advisable, to help the involution of the uterus.

CHAPTER XXII.

OPERATIONS ON THE TUBES AND OVARIES.

Salpingectomy — Indications — Instruments — Operation — After-treatment. Salpingostomy—Indications—Instruments—Operation. Ovariotomy—Indications—Instruments—Operation—Complications—After-treatment. Oöphorectomy, Salpingo-oöphorectomy—Indications—Instruments—Operation. Resection of the Ovary and Ignipuncture—Indications—Instruments—Operation.

SALPINGECTOMY.

SALPINGECTOMY (*σάλπιγξ*, a tube; *ἐκτομή*, a cutting out) is the term applied to the removal of the tubes. The term salpingotomy (*σάλπιγξ*; *τομή*, a cutting) has also been applied to this operation, but it is a term which should be only used to denote cutting operations on the tubes, and not their removal. Salpingectomy is an operation which is required in cases of adnexal disease in which it is possible to preserve the ovary. If it is necessary to remove the ovary as well as the tube, the operation is known as salpingo-oöphorectomy.

Indications.—The following conditions of the Fallopian tubes are indications for salpingectomy alone, if the ovary is sufficiently healthy to be left:—

(1) Cystic conditions, pyo-, hydro-, and hæmato-salpinx.
(2) Inflammatory non-cystic changes, which are too extensive to be cured by palliative treatment or plastic operations.
(3) New growths, which are non-malignant.
(4) Tubal pregnancy.

Instruments.—The instruments required are the same as those mentioned under the head of ventral or vaginal cœliotomy, according to the route followed (*v.* pages 285, 307).

Operation.—The first point to determine is the route by which the diseased tube is to be removed. The technique of ventral cœliotomy has been so greatly improved, and in consequence the risks so considerably diminished, that we prefer the abdominal

route in all cases of operations on the adnexa, save in the occasional cases in which it is necessary to operate in the presence of an acute infection. In such cases, we should always operate by the vagina.

As soon as the tube has been exposed, the first step consists in drawing it out into the wound. This is easily performed if

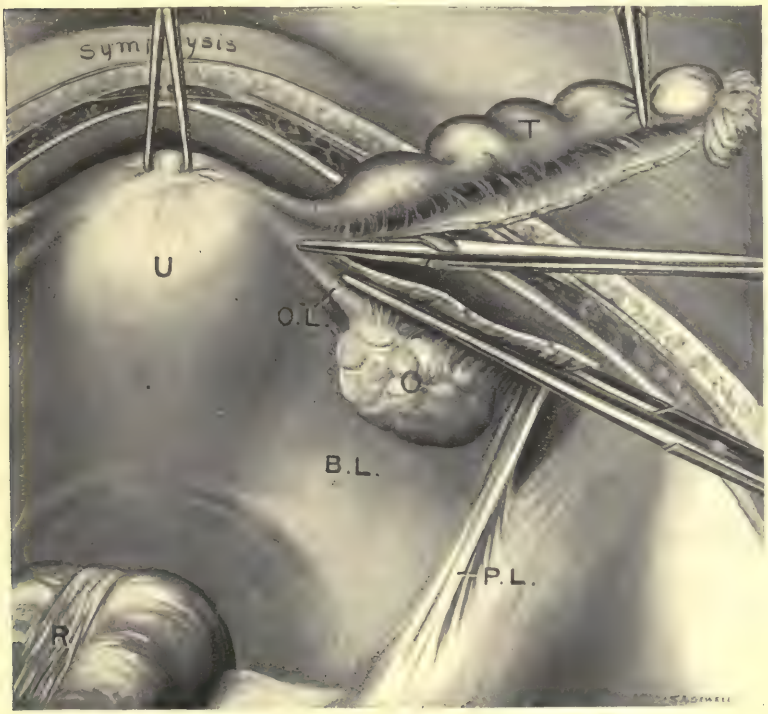


FIG. 289.—Salpingectomy. Clamping and division of the broad ligament. U. Uterus. O.L. Ovarian ligament. O. Ovary. B.L. Broad ligament. P.L. Infundibulo-pelvic ligament. T. Tube.

there are no adhesions, but if there are adhesions, these must be first separated. This can be accomplished by wiping them off by means of a gauze sponge, by breaking them down with the fingers, or, if they are very firm, by dividing them with a scalpel or scissors. If they contain vessels, the latter must be tied. These procedures are facilitated by catching the fundus of the uterus in a bullet forceps, and drawing the fundus as far upwards as it will come.

The next step consists in clamping the broad ligament with a long and slender clamp, applied as shown in Fig. 289, and dividing it above the clamp. This leaves the tube attached by its uterine insertion alone. The next step consists in cutting across the tube about half an inch from the uterus, and as in doing this, septic matter, if present, will escape, great care must be taken to avoid the dissemination of infection. With this object the tube and uterus are carefully isolated from the abdominal cavity by packing round them with sponges, and the tube is grasped with a clamp forceps just outside the spot at which it is proposed to

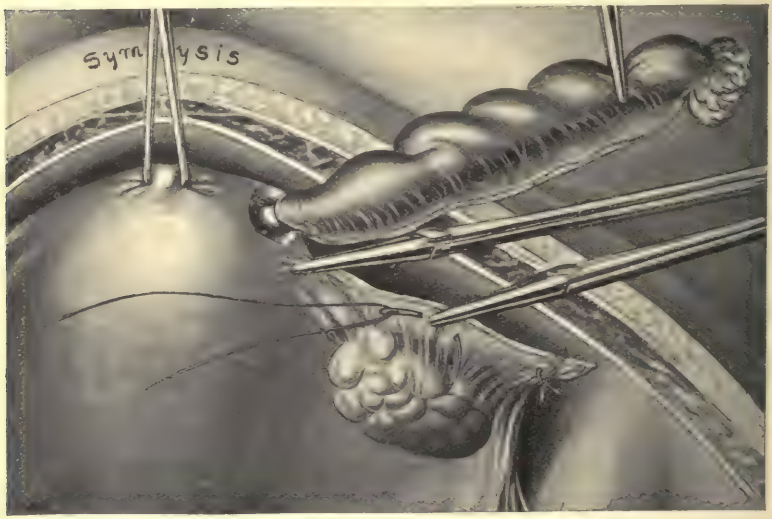


FIG. 290.—Salpingectomy. The interstitial portion of the tube is in process of excision, and the clamps on the broad ligament are being replaced by sutures.

divide it. It is then quickly cut across and removed. The uterine end is next disinfected either by wiping its lumen out with a probe carrying a little pure carbolic acid, or with the fine point of a Paquelin's cautery. If there is any bleeding from the cut end, it can usually be checked by applying a clip forceps to the side of the uterus just below the stump of the tube.

If the uterine end of the tube is thickened or contains pus, its interstitial portion should be extirpated. This is easily done by cutting it out of the uterine wall with a sharp-pointed knife (*v.* Fig. 290). The edges of the cavity left are then brought together with catgut sutures (*v.* Fig. 291, A).

The next step consists in tying any bleeding vessels, and, as a preliminary to this, the long clamp is removed, and the vessels which bleed are caught separately with smaller forceps. These vessels are then tied with catgut sutures, so passed as to include the vessel and a small portion of the broad ligament (*v.* Fig. 291). As soon as all the vessels have been tied, the top of the ligament

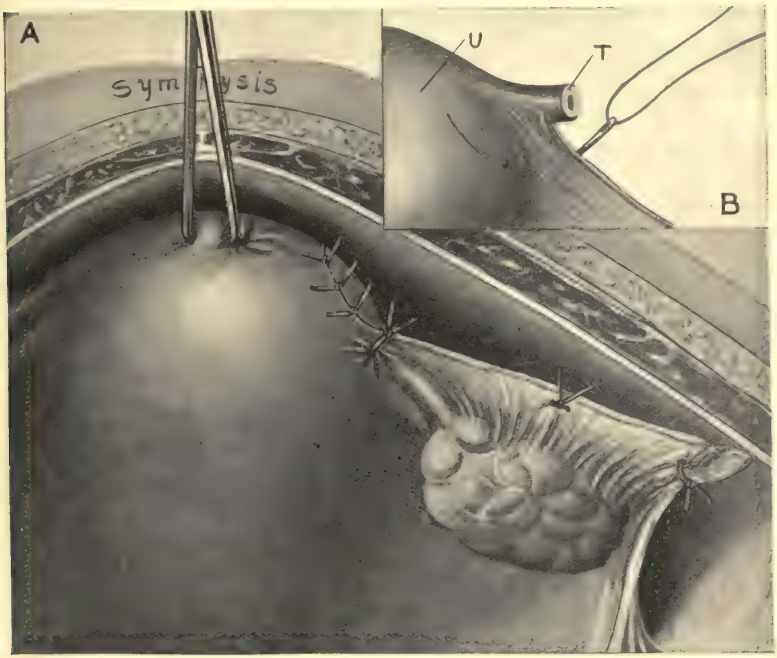


FIG. 291.—Salpingectomy. A. The operation finished, after complete excision of the tube. B. The method of tying the vessels when the stump is left. U. Uterus. T. Tube.

is stitched over with fine catgut to bring the edges of the peritoneum together.

We have already described the method of exposing the tubes by anterior or posterior colpotomy in cases in which we are operating by the vagina (*v.* page 314). As a rule, the anterior route is preferable, unless we intend merely to drain a cystic tube and not to remove it. The main difficulty of the operation is the separation of the adhesions, and, if these are dense, we should prefer to close the vaginal opening and to finish the operation by the abdominal route. If, on the other hand, the

adhesions are not dense, the tube is drawn down into the vagina, and the infundibulo-pelvic ligament is exposed. This is tied and divided, and the remainder of the broad ligament is then progressively tied and divided up to the uterus. Lastly, the stump of the tube is tied, and the tube removed. The vaginal wound is then closed in the usual manner, and, as a rule, some form of vaginal hysteropexy should be performed at the same time.

After-treatment.—The after-treatment is similar to that of ventral or vaginal cœliotomy, as the case may be (*v.* pages 299, 318).

SALPINGOSTOMY.

Salpingostomy (σάλπιγξ, a tube; στόμα, a mouth) is the term applied to the operation for making a new abdominal ostium to the tube, or to the dilatation of the natural opening which has become contracted or obliterated. Pozzi applies the term to the former operation alone, that is to those cases in which an entirely new opening is made; while to the latter and more common operation he applies the term salpingotomy (σάλπιγξ; τομή, a cutting). The value of salpingostomy, if it is successful, lies in the fact that it may enable an ovum to reach the uterus, and pregnancy to occur. Some successful cases have been recorded, but it is probable that frequently the edges of the new ostium adhere to one another, and again obliterate the opening.

Indications.—Salpingostomy is indicated in catarrhal non-cystic conditions of the tube, in which the original ostium can be re-established, and in which the remainder of the tube is patulous, as proved by passing a probe through it up to the uterus.

Instruments.—The instruments are the same as those required for salpingectomy, with the addition of a fine probe (*v.* page 474).

Operation.—The peritoneal cavity is opened either through the abdominal wall or the vagina, and the tube is freed from its adhesions and drawn out through the wound. An attempt is then made to re-open the ostium with a blunt probe, or, if that fails, by dividing the adherent fimbriæ with scissors, and a probe is passed through the tube into the uterus in order to see that the lumen is patent. Next, a grooved director is introduced through the fimbriated extremity, and is passed an inch or so up the tube,

and turned so that its point presses against the upper surface of the tube. A scalpel is then pushed along the groove in such a manner as to divide the wall completely from within outwards. Lastly, the mucous membrane inside the tube is sutured to the covering peritoneum so as to keep the incision patent (*v.* Fig. 292), and at the same time to stop any bleeding which may occur. In this way, a wide and permanent ostium is obtained. If it is thought necessary, the edges of this ostium may be drawn as far as possible over the ovary and sutured there by a continuous catgut suture. The objection to this procedure is that only those Graafian follicles which rupture on the portion of the surface of the ovary grasped by the tube can discharge ova into the latter, and that thus the chance of an ovum reaching the uterus is lessened.

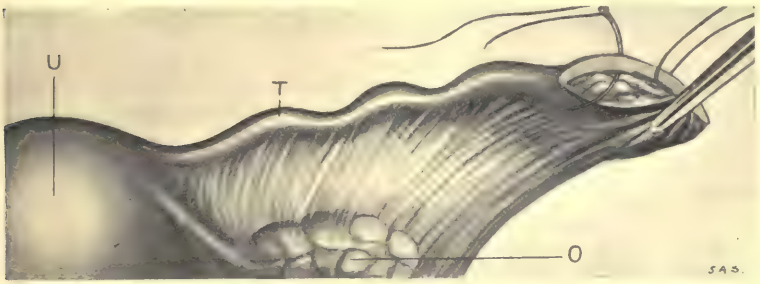


FIG. 292.—Salpingostomy. The distal end of the tube has been split, and its mucous and peritoneal coats are being brought together by suture. U. Uterus. T. Tube. O. Ovary.

After-treatment.—The after-treatment is similar to that of ventral or vaginal cœliotomy, as the case may be (*v.* pages 299, 318).

OVARIOTOMY.

Ovariotomy (*ovarium*, an egg-holder; τομή, a cutting) is the term applied to the removal of the ovary for a new growth as distinguished from oöphorectomy, by which is meant the removal of the ovary for any condition other than a new growth. The term ovariotomy is also loosely applied to the removal of cystic tumours of the broad ligament.

Indications.—Ovariotomy is indicated in the case of all malignant and papillary tumours of the ovary or broad ligament, which

are not too far advanced to prevent their entire removal, and in the case of benign tumours which cannot be removed by resection (*v.* page 490).

Instruments.—The instruments are the same as those required for ventral or vaginal cœliotomy as the case may be [(*v.* pages 285, 307), with the addition of a cyst forceps (*v.* Fig. 293).

Operation.—Small solid tumours and small or medium-sized cystic tumours of the ovary may be removed by the vaginal route. Medium-sized or large solid tumours and large cystic tumours must be removed by the abdominal route.

The abdominal operation is carried out as follows :—The abdomen is opened in the middle line in the usual manner (*v.* page 288). The tumour is thus exposed, and the fingers or hand, according to the size of the opening in the abdominal wall,

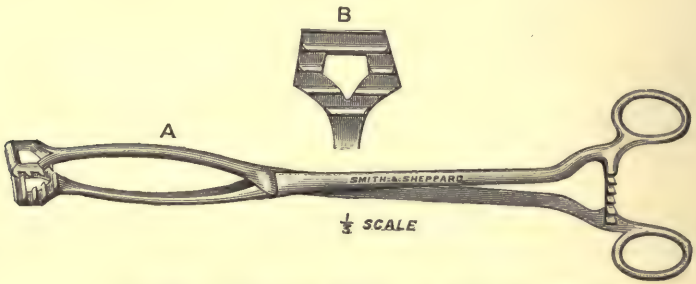


FIG. 293.—Péan's cyst forceps. B. View of blade.

are passed into the peritoneal cavity in order to correct our original diagnosis, or to make it more definite by noting the following points :—

(1) The presence or absence of peritoneal adhesions.
(2) The relation of the tumour to the pelvic and abdominal contents.
(3) The nature of the tumour, *i.e.*, whether it is solid or cystic.
(4) If cystic, whether it is composed of one or more large cysts, or of an indefinite number of small cysts.

As the details of the operation depend upon the answers to these questions, it will be well to discuss each of them separately.

(1) The presence or absence of peritoneal adhesions.—Adhesions with the intestines, the uterus, and the parietal

peritoneum may exist, and very frequently do exist, in the case of long-standing tumours. If these adhesions are recent, they can be easily broken down; but, if they are of long standing, they may convert what would have been otherwise an easy operation into one of extreme difficulty. Recent adhesions can be separated with the fingers, or can be wiped off with a sponge. Long string-like adhesions may be torn across or divided with a scissors. If vessels run in them, they must be tied on the peritoneal side of the division. Firm fibrous adhesions, between the intestines or uterus and the tumour, must be divided with the knife, the division being always made, in the case of intestino-ovarian adhesions, at the expense of the tumour, unless the latter is malignant, in which case it may be necessary to resect a portion of the intestinal wall. If such adhesions contain vessels, the bleeding may be checked by sewing over the cut surface with fine silk or catgut, and the same must be done if their separation involves the stripping of the peritoneal coat of the intestine. All parietal adhesions, that can be reached, must be broken down before the tumour is tapped, as they prevent the latter from being drawn outwards as it collapses, and so render more likely the escape of its contents into the peritoneal cavity.

(2) The relations of the tumour to the pelvic and abdominal contents.—The relations of the tumour enable a diagnosis to be made between tumours of the ovary, of the uterus, and of any of the abdominal organs. An ovarian tumour is moored to the floor of the pelvis at one or other side by the broad ligament, which is either stretched out in the form of a pedicle, or which invests the tumour owing to the intra-ligamentous growth of the latter. If the tumour is pedunculated, it is—relatively to its size—more freely movable than is an intra-ligamentous growth, and at the same time its area of attachment to the pelvic floor is very much narrower. It may not be possible, in the case of a large cystic tumour, to make out these points until the contents have been evacuated, but, when this is done, the relations of the broad ligament are easily seen.

(3) The nature of the tumour, *i.e.*, whether it is cystic or solid.—It is as a rule an easy matter to determine whether the tumour is cystic or solid. If cystic, it can usually be so diminished by tapping that it can be drawn out through a comparatively short abdominal opening. If, on the other hand,

it is solid, the abdominal opening must be extended sufficiently to permit of its removal intact.

(4) If cystic, whether the tumour is composed of one or more large cysts, or of an indefinite number of small ones.—This point is of importance and can be determined by the appearance of the tumour and by palpation. If an ovarian cyst is composed of one

FIG. 294.—Ovariotomy. The cyst is punctured, and the fluid expressed by the pressure of the hands on the abdominal walls. C. Ovarian cyst. B. Basin for receiving fluid. (The usual sterilised coverings on the abdomen are omitted in order to make the position of the hands and of the incision more obvious.)

large loculus, or of several large or medium-sized loculi, its size can be reduced to a marked extent by tapping. But there are other cases in which the number of the cysts is apparently infinite, and in which the diminution brought about by tapping them is so small as to be of very slight importance in comparison with the delay in the operation, the increased hæmorrhage, and the almost certain fouling of the peritoneal cavity which such an attempt necessitates. Such cysts, as soon as it is obvious that

they cannot be further reduced in size, should be treated as solid tumours, and removed intact.

As soon as the foregoing points have been determined, the remaining steps of the operation are as follows :—

(1) Separate all adhesions that can be reached.

(2) If the tumour is solid or micro-cystic, increase the abdominal incision until it is sufficiently large to allow the tumour

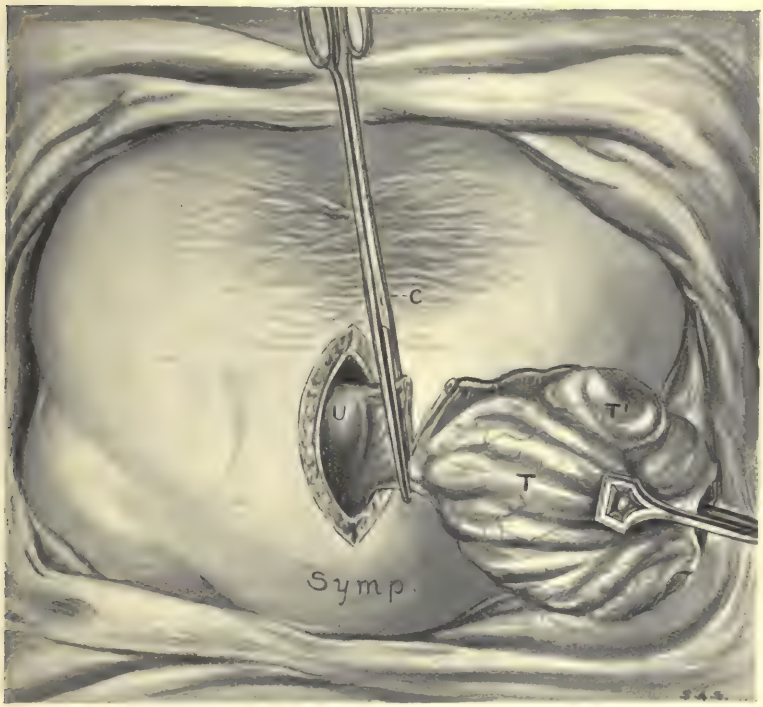


FIG. 295.—Ovariotomy. The collapsed cyst has been drawn out of the peritoneal cavity. Its pedicle is clamped, and is in process of division. U. Uterus. T. Cyst. T¹. Accessory cyst. C. Clamp on pedicle.

to be drawn out intact. If it is cystic, tap it in the following manner :—An assistant presses gently upon the tumour with his hands laid flat on the abdominal wall at each side of the incision (*v.* Fig. 294). By this means, the tumour is made to bulge outwards through the wound, and the abdominal wall is kept in close contact with it, so preventing the escape of fluid into the peritoneal cavity. A small incision is then made with a scalpel in the

centre of that part of the cyst wall which bulges through the wound. The pressure exerted by the assistant drives the contents of the cyst through this opening in a steady stream, which

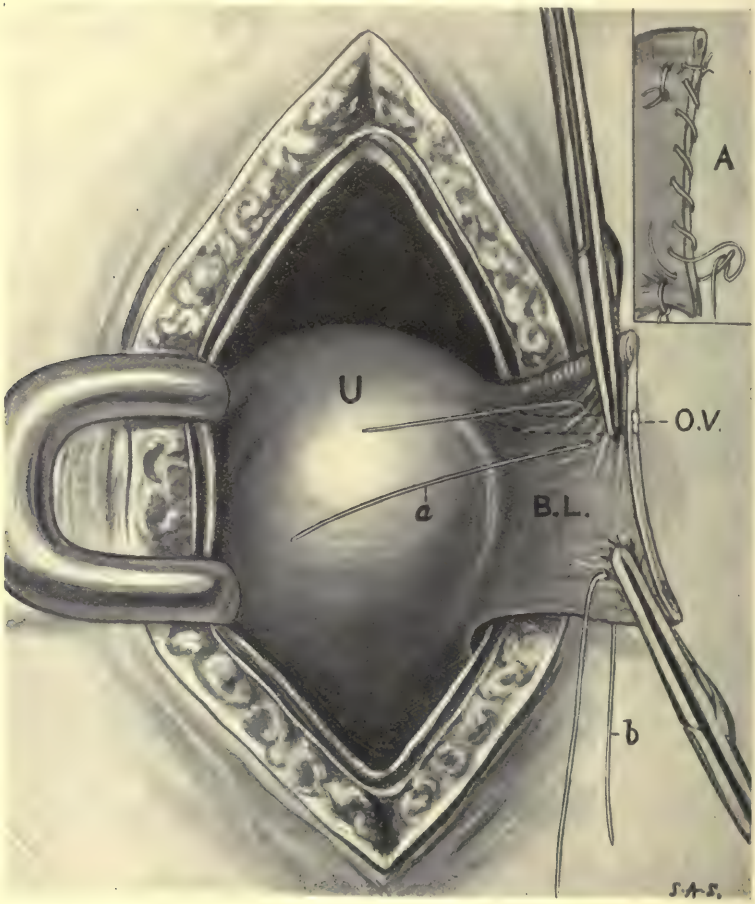


FIG. 296.—Ovariotomy. The long clamp has been replaced by two shorter clamps on the ovarian and uterine vessels, and these vessels are in process of being tied. U. Uterus. O.V. Ovarian ligament. B.L. Broad ligament. *a*. Ligature on ovarian artery. *b*. Ligature on infundibulo-pelvic ligament. A. Stump of pedicle, showing arteries tied, and continuous catgut suture applied to peritoneal edges.

can be directed into a basin. As the cyst collapses, the operator passes one blade of a stout clamp forceps, or of a Péan's cyst forceps, into the cyst, and, the other blade being outside, takes a

firm hold of the wall. By means of this forceps, supplemented if necessary by others, the collapsing cyst is drawn gradually out of the abdomen (*v.* Fig. 295).

(3) If the cyst is pedunculated, its pedicle is caught in a clamp forceps, and is cut across above the forceps, and the tumour removed (*v.* Fig. 295). In applying the forceps care must be taken to avoid including the round ligament, as it is quite unnecessary to remove or injure the latter. The vessels in the pedicle are then caught separately in smaller forceps, and tied as has been already described (*v.* page 477 and Fig. 291). Lastly, the peritoneum is brought together with a continuous suture of catgut over the cut edge of the broad ligament (*v.* Fig. 296, A). If the cyst is intra-ligamentous, and consequently has no pedicle, a pedicle must be formed for it in which the main blood-vessels will be included. This can usually be done by incising the peritoneal capsule of the tumour and stripping it off the latter until the base—that is the portion which is not covered by peritoneum—is reached. The blood-vessels enter at this point, and, if the cyst is drawn upwards, they will be put upon the stretch, and room will be given to tie them either together or separately. Any excess of peritoneum is then cut away, and the edges are brought together by means of a continuous catgut suture. It is always well to complete the operation by performing ventral suspension of the uterus (*v.* page 464).

Ovariotomy performed by the vaginal route in the case of quite small tumours is a very simple operation. It can be performed through either the anterior or the posterior fornix. The ovary is exposed and caught in a forceps and drawn down. Its pedicle is then tied, the tube being removed at the same time, if it cannot be separated from the ovary. Some operators, and notably Wertheim, also advise the removal of medium sized cystic tumours by this route. In such cases, if the cyst lies in front of the uterus, the anterior vaginal route is always followed. Anterior colpotomy is performed in the usual manner, and the cyst wall is made to present at the opening by pressure applied over the pubes. A trochar and canula are then passed into the cyst, the trochar is removed and the fluid is allowed to flow. As the cyst becomes flaccid, it is caught with a forceps and drawn down, additional forceps being applied, one above the other, as it descends. Finally, the entire empty cyst passes

through the vaginal opening. Its pedicle is then pulled down, and is tied and divided.

If the cyst occupies Douglas' pouch, Wertheim's advice is still to operate by the anterior route, although the posterior route is also available if it is thought better. In the former case, the cyst is brought into view, after opening the peritoneal cavity, by traction on the ovarian ligament, and is then tapped and drained as has been described. In the latter case, the cyst is exposed as soon as the peritoneum is incised. The chief objection to the posterior route, which at first sight appears to be the more suitable, is the difficulty of tying the pedicle if it is short. We do not recommend the removal of anything but very small tumours by the vaginal route, on account of the impossibility of making an accurate diagnosis of the nature of the tumour without a more complete inspection than can be obtained through a vaginal opening. If, however, this route is followed, we desire again to repeat Wertheim's advice to refrain from bringing the fundus of the uterus into the vagina when we wish to expose or remove the appendages, since by so doing we merely block up the vaginal opening. Up to the present, most operators have given the opposite advice.

Complications.—The most important complications, which may be met with in the course of an ovariotomy, are:—

(1) Adhesions.—These are met with of all degrees of strength. Usually they can be easily broken down or divided, but on the other hand—though very rarely—they may be so dense and numerous as to prevent the removal of the cyst wall.

(2) Fistulous openings between the cyst and any of the abdominal viscera.—If such openings are found to be present, they must be closed as soon as the cyst is separated, in order to prevent fouling of the peritoneal cavity.

(3) Twisted pedicle.—In some cases, as the cyst grows, the pressure of the abdominal walls and contents acts upon it in such a manner as to make it rotate, and so twist its pedicle. The chief danger of this condition during the operation is that as the cyst empties it tends to untwist itself, and, as this untwisting occurs, the opening in its wall may be carried away from the opening in the abdominal wall, so permitting an escape of the contents into the peritoneal cavity. This is an accident which can be best avoided by seizing the cyst wall in clamp forceps the moment after the incision through the wall has been made.

(4) Suppuration of the contents.—There is nothing to be said about this condition except to call attention to the extreme importance of preventing any of the contents finding their way into the peritoneal cavity. If possible, a tumour with suppurating contents should be removed entire, as is usually done in the case of a dermoid.

After-treatment.—The after-treatment of ovariotomy is similar to that of ventral or vaginal cœliotomy (*v.* pages 299, 318).

OÖPHORECTOMY—SALPINGO-OÖPHORECTOMY.

Oöphorectomy (ὠόν, an egg; φορέω, I bear; ἐκτομή, a cutting out) is the term applied to the removal of the ovary for any condition other than a new growth. Salpingo-oöphorectomy includes the removal of both ovary and tube.

Indications.—Oöphorectomy is indicated in the following conditions, when they cannot be relieved by non-operative measures or permanently cured by puncture or resection of the ovary:—

(1) Oöphoritis, and ovarian abscess.

(2) Cirrhosis of the ovary.

Salpingo-oöphorectomy is indicated when the tube also is diseased.

Instruments. — Similar instruments are required as for salpingectomy (*v.* page 474).

Operation.—The ovary is exposed by whatever route is considered most suitable. In operating by the abdominal route, it is seized in a forceps, and, if possible, drawn into the wound, and away from the broad ligament so as to put its attachments to the latter and to the uterus on the stretch. Clamps are then applied to the ovarian ligament and to the vessels which pass to the ovary through the infundibulo-pelvic ligament (*v.* Fig. 297). The ovarian ligament is divided, and the ovary is removed from the back of the broad ligament. The ovarian ligament and any bleeding vessels in the broad ligament are tied separately, and, if a gap has been left in the broad ligament, the divided edges of peritoneum are sutured together by means of continuous catgut suture.

Salpingo-oöphorectomy (*v.* page 474) is performed in a very similar manner to salpingectomy, save that instead of applying a single clamp between the tube and the ovary, a clamp is

applied to the infundibulo-pelvic ligament outside the ovary and to the broad ligament beneath it, and a second and smaller clamp to the ovarian ligament (*r.* Fig. 298). The broad ligament is then divided, commencing at the outer end, and working up to the uterine insertion of the tube, which is in turn divided as has been described (*r.* page 476). The clamps are then replaced by ligatures, using catgut if any inflammation is present. Lastly, the peritoneum is brought together over the cut edges of the ligament.

If the vaginal route is adopted, the operation may be performed

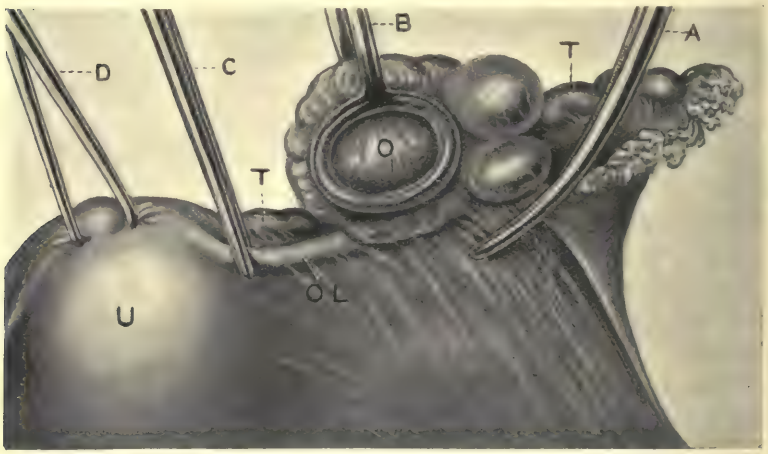


FIG. 297.—Oöphorectomy. The ovarian ligament and infundibulo-pelvic ligament have been clamped, and the ovary is drawn upwards to facilitate its removal. U. Uterus. D. Forceps on uterus. C. Clamp on O.L., ovarian ligament. T. Tube. O. Ovary. B. Ovarian forceps. A. Clamp on infundibulo-pelvic ligament.

through either the anterior or the posterior fornix. The former is the more suitable in most cases, as if the infundibulo-pelvic ligament is short, it is difficult to reach it through the posterior fornix. Oöphorectomy and salpingo-oöphorectomy are comparatively easy in the absence of adhesions, but if the latter are dense the operation will be most difficult, and, if there are intestinal adhesions, it may be impossible on account of the difficulty of reaching the intestine. Moreover, violent manipulations with the object of separating adhesions may lead to rupture of the intestinal wall.

If one is driven to operate by this route on account of the

presence of a still active infection, it will usually be necessary to remove the uterus as well as the appendages. In such cases, the presence of adhesions often renders it difficult to open the peritoneal cavity, as both the utero-vesical pouch and the pouch of Douglas may be obliterated. If this is so, the uterus must be split mesially. One half is then pushed back into the pelvis in order to give room to reach the appendages belonging to the other half. These are separated with the finger and removed

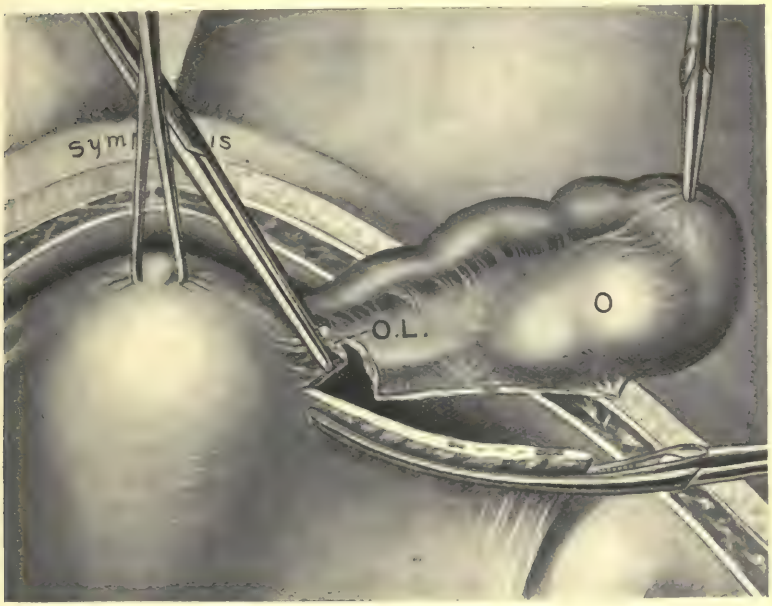


FIG. 298.—Salpingo-oöphorectomy. Clamps in position and the broad ligament divided. O.L. Ovarian ligament. O. Ovary.

with their corresponding half uterus. The other half uterus is then again drawn down, its adnexa are in turn separated, and both are removed. The pelvic cavity should then be plugged with iodoform gauze. Detailed descriptions of these operations will be found in Landau's "Radical Vaginal Operation" and in Wertheim's "Vagino-Peritoneal Operations."

There are certain principles which apply to all operations on the uterine appendages, when operating by the abdominal route. They are as follows:—

(1) Never tie the broad ligament with interlocking sutures or

with a so-called Staffordshire knot. The objections to each of these methods are obvious. In the first place, such methods pull the top of the ligament together and so shorten it, and the contracted ligament in turn tends to drag the uterus backwards. Secondly, they necessitate the use of silk, as it is difficult or impossible to include so great a mass satisfactorily or sufficiently tight in a catgut ligature. Thirdly, there is always a risk of the slipping of ligatures so applied, unless a considerable amount of tissue is left beyond them, and as this tissue is deprived of blood and is probably infected with bacteria, it may subsequently slough and give rise to the formation of adhesions or even to general infection.

(2) Never use silk in the presence of inflammation, unless it is impossible to avoid doing so. Silk remains permanently, and, if infection is present, it tends to become a permanent depository of infection, whilst catgut is absorbed.

(3) Never remove more than is necessary, and do not tie the stump of the tube if one is left. The complete removal of the uterine appendages on both sides is sometimes necessary, but more often is unnecessary. The retention of even a portion of the ovary adds very greatly to the future comfort of the patient, and if even the stump of a patent Fallopian tube is also retained, there is present the possibility, at any rate, of a future pregnancy instead of the certainty of sterility.

(4) Always conclude the operation by performing ventral suspension of the uterus. The reason of this is obvious. If the pelvis prior to operation has contained inflammatory masses, the uterus is almost certain to fall back when they are removed; and, as its peritoneum is probably roughened, it will contract fresh adhesions and remain permanently fixed. The persistence of pain, which is said so often to follow operations on inflamed uterine appendages, is frequently due to neglect of this precaution.

After-treatment.—The after-treatment is similar to that of a ventral or vaginal cœliotomy, as the case may be (*v.* pages 299, 318).

RESECTION OF THE OVARY AND IGNIPUNCTURE.

These two operations, which form so large a part of the conservative surgery of the ovary, can be best described together.

By the term resection of the ovary is meant the excision of the diseased portion of the ovary, with the object of leaving the healthy portion. Ignipuncture is the term applied to the cauterisation of small cysts of the ovary, with the object of destroying the cyst wall and leaving the healthy portions of the ovary behind.

Indications.—One or other operation, or sometimes both, are indicated in the following conditions, when palliative measures fail, and when it is possible to destroy or remove the diseased

FIG. 299.—Resection of ovary. O. Ovary. C. Cyst. *a*. Line of incision. A. Suture of resultant gap in ovary.

portion of ovary while still leaving a portion capable of carrying on its function:—

(1) Small benign tumours.
(2) Large cystic follicles.
(3) Cyst of the corpus luteum.
(4) Sclero-cystic oöphoritis.

Resection is indicated when the pathological condition is limited to a portion of the ovary, ignipuncture is indicated when the ovary is invaded more or less uniformly with small cysts.

Instruments.—The instruments are the same as those required for cœliotomy, ventral or vaginal as the case may be (*v.* pages 285, 307), with the addition of a Paquelin's thermo-cautery with a stiletto-shaped blade.

Operation.—These operations can be performed by the abdominal or the vaginal route. To perform resection, the ovary is seized between the finger and thumb, and the part to be removed is marked out with a scalpel by an oval incision (*v.* Fig. 299). The incision is then carried downwards into the ovarian tissue, in such a manner that the whole of the diseased part is cut out; or, in the case of a cyst, the latter may be dissected out with scissors, or enucleated. The cut edges are then brought together by means of an interrupted or a continuous catgut suture, which is

FIG. 300.—Ignipuncture of microcystic ovary. The ovary has been split, and the cysts punctured and their lining destroyed. (The ovary is shown enlarged for purpose of clearness.)

passed so as to include the entire depth of the wound. This also answers the purpose of checking hæmorrhage (Fig. 299, A).

For ignipuncture, a Paquelin's thermo-cautery is used, with a sharp stiletto-shaped blade. It is heated to a cherry-red, and each cyst in turn punctured with it. The position of the cysts is determined, in the case of those which are superficial, by noting the manner in which they project above the surface of the ovary; in the case of those that lie more deeply, by the fact that the surface of the ovary is less, or perhaps more, resistent over them. If the ovary is much enlarged, it may be necessary to make an incision along its free border, extending at least

half-way through the ovary itself (*c*. Fig. 300). In this manner, deeply-placed cysts will be found. This incision must be afterwards closed with a continuous catgut suture.

When judging the effect of such a suture in checking hæmorrhage, we must remember that the ovary is more likely to bleed after it has been returned to the pelvis than when it is drawn out through the abdominal incision. Consequently, we must always examine the ovary carefully after it has been returned to the pelvis to see that all bleeding has ceased.

CHAPTER XXIII.

OPERATIONS ON THE UTERINE LIGAMENTS AND PELVIC PERITONEUM.

Shortening of the Utero-sacral Ligaments — Intra-peritoneal Shortening — Extra-peritoneal Shortening—Shortening of the Round Ligaments—Indications—Instruments — Extra-peritoneal Shortening, Intra-peritoneal Shortening — Complications—After-treatment. Vaginal Incision and Drainage—Indications—Instruments—Operation—After-treatment—Complications. Radical Treatment of Peritoneal Adhesions—Instruments—Operation—After-treatment.

SHORTENING OF THE UTERO-SACRAL LIGAMENTS.

Shortening of the utero-sacral ligaments, with the object of drawing the cervix upwards and maintaining it in that position, can be performed intra-peritoneally by the abdominal or extra-peritoneally by the vaginal route. Personally, we have no experience of the former operation, and prefer the latter one.

Indications.—The operation is indicated in cases in which there is marked lengthening of these ligaments, as in cases of prolapse in which the cervix has descended and the uterus tends to lie in the axis of the vagina.

Instruments.—The instruments required for the intra-peritoneal operation are similar to those required for ventral cœliotomy (*v.* page 285); the instruments required for the extra-peritoneal operation are similar to those required for vaginal cœliotomy (*v.* page 307).

Operations.—The two operations must be described separately.

Intra-peritoneal Shortening.—This operation, as described and practised by Stanmore Bishop, is carried out as follows:—The abdomen is opened in the middle line, and the patient is placed in the Trendelenburg position, so as to expose Douglas' pouch and keep the intestines out of the field. Two threads are then passed through the broad ligaments, one on each side of the uterus, enclosing the tube and round ligament. The ends of

these threads are tied, and by using them as tractors the fundus of the uterus is drawn forwards. An assistant presses upwards the posterior vaginal fornix from below, so as to render it prominent. On each side, a stout silk thread is passed vertically through the wall of the fornix, avoiding the mucous lining, so that each protruding end is half an inch distant from the other and the whole loop one-third of an inch from the cervix. The fornix is now drawn up to the sacrum, and a spot is chosen on the peritoneum covering the sacrum, avoiding carefully the subjacent vessels and nerves and the ureter, and well outside the rectum. The needle carrying the suture is entered deeply at this spot so as to embrace the periosteum covering the bone, and is brought out again half an inch directly above its point of entrance. Before tying the suture, a narrow strip of peritoneum is removed from that portion of the fornix which lies in its grip, so as to bare the connective tissue beneath. This procedure is repeated on the opposite side, and the sutures are tied and their ends cut short. Sometimes the position of the rectum will only permit of a single suture, and this should then be placed more centrally, and its area of attachment should be somewhat broader. The new ligament or ligaments are now formed, and the cervix hangs in its normal position from the sacrum by that portion of the vagina which lies between it and the sutures. The traction threads through the broad ligaments are then removed and the abdomen closed.

Wertheim performs intra-peritoneal shortening in a different manner. He operates by the vaginal route and first extroverts the uterus through an opening in the anterior fornix. By dragging the uterine body well down, the utero-sacral ligaments are exposed. Each ligament is then caught in a forceps and drawn down, so that it forms a loop, and the sides of this are united with sutures. The operation is thus very similar to that for intra-peritoneal shortening of the round ligaments (*v.* page 503).

Extra-peritoneal Shortening.—The first step of this operation consists in drawing the cervix down with an American forceps and then in making a circular incision round it just above the vaginal insertion. This incision is similar to that described under the head of supra-vaginal amputation of the cervix (*v.* page 383). The next step consists in pushing the vaginal mucous membrane off the cervix exactly as in the latter operation,

so as to expose the supra-vaginal portion. If necessary, supra-vaginal amputation is then performed. The utero-sacral liga-

FIG. 301.—Extra-peritoneal shortening of the utero-sacral ligaments. The ligaments have been exposed, and are being caught in clip forceps. L. Ligament. P.V. Posterior vaginal wall.

ments are next exposed at the point at which they are inserted into the uterus, and each is caught in a clip forceps about half an inch or so above its attachment (*v*, Fig. 301). One of

two methods can then be adopted. A suture of stout catgut can be passed round the ligament on one side and tied, and another

FIG. 302.—Extra-peritoneal shortening of the utero-sacral ligaments. The ligaments have been detached posteriorly and brought round in front of the cervix. A.V. Anterior vaginal wall. L. Ligament.

similarly round the ligament on the opposite side. These sutures should each be tied as high up on the ligament as can be reached. The ends of each suture are then brought down in front of the

cervix, and the traction on the latter is relaxed so as to allow it to be pushed upwards. The sutures are then tied in such a manner as to draw a loop of each ligament into contact with a loop from its fellow in the middle line in front of the cervix. A few additional sutures are then introduced so as to fix them firmly in this position.

The alternative method consists in applying the clip forceps as before, and in then cutting each ligament across between the

FIG. 303.—Extra-peritoneal shortening of the utero-sacral ligaments. The ligaments sutured together in front of the cervix. L. Ligament.

forceps and the uterus. The forceps are then brought round in front of the cervix, and the ligaments are sutured to one another and to the anterior wall of the cervix, as is shown in Figs. 302, 303.

The result of each of these methods is to bring the ligaments under the cervix and to form a sling which will draw the latter upwards and backwards. The cervix is thus effectually prevented from again falling into the axis of the vagina.

The final step of the operation consists in suturing the mucous membrane of the vagina into place over the cervix.

After-treatment. — The after-treatment is similar to that of ventral or vaginal cœliotomy, as the case may be (*v.* pages 299, 318).

SHORTENING OF THE ROUND LIGAMENTS.

Shortening of the round ligaments with the object of correcting retro-deviations of the uterus can be performed either extra-peritoneally at the external abdominal ring (Alexander), or

FIG. 304.—Relationships of the right round ligament at the external abdominal ring (Waldeyer). A. Superficial epigastric artery and vein. B. External pubic vein. C. External spermatic nerve. D. Ileo-inguinal nerve. E. External pillar of external abdominal ring. F. Internal pillar of external abdominal ring. G. Superficial abdominal fascia. H. Round ligament.

intra-peritoneally by the abdominal route (Dudley, Wylie) or by the vaginal route (Wertheim).

Indications.—Cases of retro-deviation of the uterus in which it is desired to effect a radical cure, and in which the appendages and the pelvic peritoneum are healthy (*v.* page 105).

Instruments.—The instruments required for extra-peritoneal shortening are :—A scalpel, a needle-holder, medium whole-curved needles, two small retractors, twelve clip-forceps, a small toothed dissecting forceps, and a director with a hook at one end (*v.* Figs. 140, 141, 142). For intra-peritoneal shortening the instruments required are those given under the head of ventral or vaginal cœliotomy (*v.* pages 285, 307).

Operations.—The two classes of operation—extra and intra-peritoneal—must be described separately.

Extra-peritoneal Shortening. — Extra-peritoneal shortening—Alexander's operation—is performed as follows :—Commence by placing the uterus in a normal position. An incision, two to four inches in length, is then made through the skin and fat. It commences just above the spine of the pubis, and runs upwards and outwards parallel to Poupart's ligament. By dissecting up the fat a little, the fibres of the external oblique are exposed.

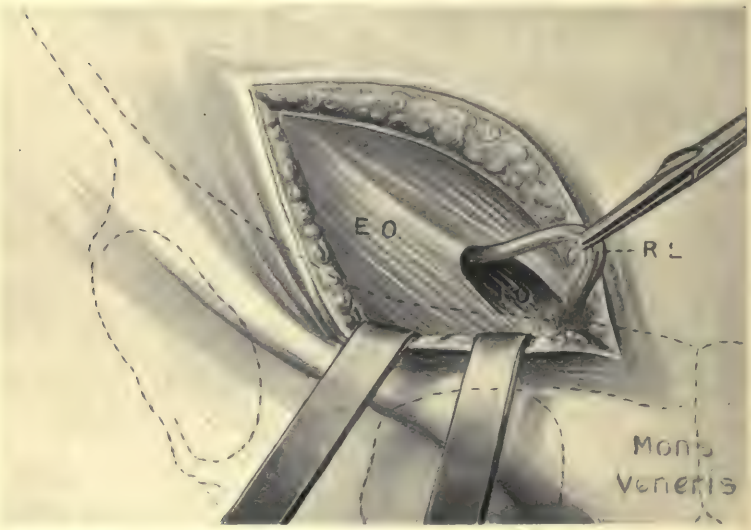


FIG. 305.—Extra-peritoneal shortening of the round ligaments. The ligament is exposed at the external abdominal ring, and drawn outwards with clip forceps. E.O. External oblique muscle. I.O. Internal oblique muscle. R.L. Round ligament.

The external abdominal ring, through which the round ligament emerges, will be found either by looking for the small boss of fat which bulges through it, or by laying the tip of the finger on the pubic spine, when the ring can be felt immediately above and slightly to the outer side of the latter. The round ligament must next be found, a proceeding which is sometimes attended with a little difficulty, owing to the manner in which the fibres of the ligament are spread out and mingled with the surrounding cellular tissue. It may be recognised by looking for a small nerve which also emerges through the ring—the genital branch of the

genito-crural nerve—directly under which it lies (*v.* Fig. 304) Owing to this difficulty, it has been recommended to open up the inguinal canal for a short distance, as the ligament will then be readily found lying in it (*v.* Fig. 306). There is no objection to such a course, and indeed some operators open the whole length of the canal as a routine measure. The ligament is then caught in a small clamp forceps, and drawn gently down. At first it appears covered by fascia, which must be stripped off it. A fresh grip is then taken of it with a second clamp, applied above the first, the fascia again cleared off, and this process con-

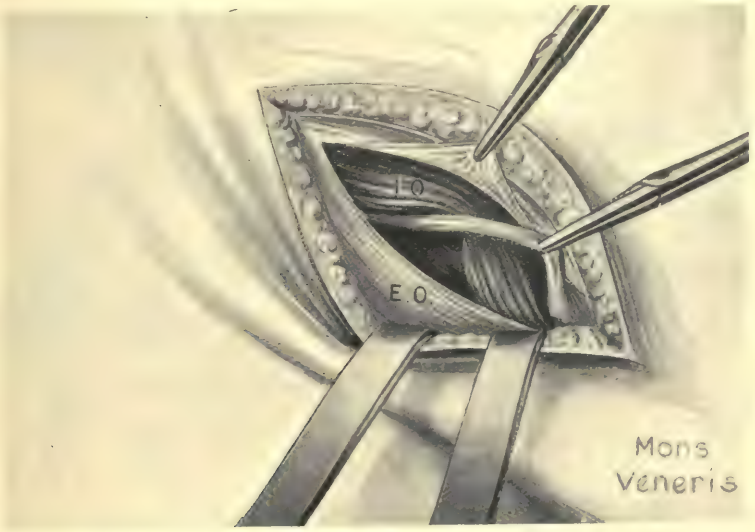


FIG. 306.—Extra-peritoneal shortening of the round ligaments. The inguinal canal has been opened and the ligament thus exposed. E.O. External oblique muscle. I.O. Internal oblique muscle.

tinued until the pearly-white ligament appears. There is usually a little difficulty in drawing the ligaments down until the fascia is stripped off, but once this is done, it pulls easily out to the extent of several inches.

The skin and fat are then divided in a similar manner at the opposite side, and the ligament exposed and isolated.

If there is any reason to doubt that the uterus is in its normal position, an assistant must at this stage examine by the vagina, and, if necessary, replace it. Each ligament is then caught in a clip forceps or in the fingers, and is drawn gently outwards until

it is obvious that all the slack of the ligaments has been drawn out (*v.* Figs. 305, 306). The usual amount thus pulled out is from four to six inches.

The next step consists in the fixing of the ligament in its new position. This can be best done by mattress sutures of silk or silkworm gut, so passed as to include both sides of the ring, or of the canal if the latter has been opened, and the ligament (*v.* Fig. 307, A). The needle is entered through the aponeurosis of the external oblique at the inner side of the ring or canal, and at the top of the opening. It is then passed successively through the round ligament, and through the aponeurosis at the outer side of the ring. It is then re-entered through the aponeurosis at the

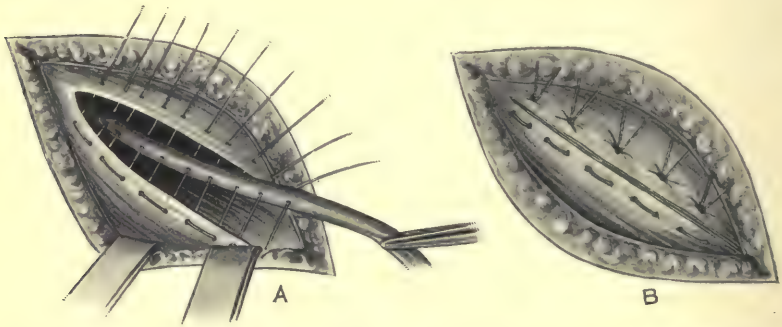


FIG. 307.—Extra-peritoneal shortening of the round ligaments. A. Method of closing the inguinal canal and fastening the ligament in its new position. B. The sutures tied.

outer side of the ring a centimetre below the point of emergence. It again transfixes the ligament, and emerges through the aponeurosis at the inner side of the ring a centimetre below its point of introduction.

As many such sutures as are required are introduced, care being taken that the assistant keeps the ligament drawn tightly outwards all the time, in order that it may be transfixed by the sutures at a sufficiently high point. As soon as all the sutures are inserted and tied (*v.* Fig. 307, B), the projecting piece of ligament is cut off.

The last step consists in closing the wound by means of a subcutaneous continuous suture of silkworm gut which brings together the fat, and a sub-cuticular suture bringing together the skin edges (*v.* page 294).

In performing this operation, it sometimes happens that the ligament cannot be found, or that, during traction on it, it breaks away, either owing to too strong traction or to abnormal weakness of the ligament. In such cases, first open the inguinal canal through its full length, and then, if the ligament or its end still cannot be found, push aside the fibres of the transversalis muscle, expose the peritoneum, and open the peritoneal cavity. The intra-peritoneal portion of the ligament can then be found and

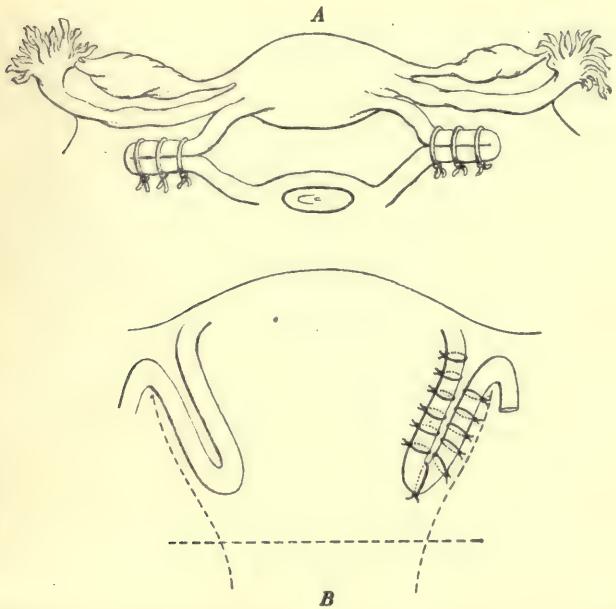


FIG. 308.—Intra-peritoneal shortening of the round ligaments. A. Wylie's method. B. Dudley's method. (*Labadie-Lagrave.*)

caught in a light clamp forceps and drawn into the wound. Usually, by pulling upon it, the extra-peritoneal portion can be found, and the operation can be finished as has been described, but, if this is not possible, the same object can be attained by fixing the intra-peritoneal portion to the aponeurosis. Whichever procedure is adopted, the peritoneum is closed with catgut, and the divided aponeurosis carefully brought together with mattress sutures or a continuous silk suture, as has been described.

Intra-peritoneal Shortening.—Intra-peritoneal shortening can be performed by the abdominal or the vaginal route. The former is

specially indicated when, in addition to fixing the uterus in a normal position, it is also necessary to separate adhesions. Wylie, who operates by the abdominal route, catches the ligament in a forceps, and draws it outwards in such a manner as to double it on itself (*v.* Fig. 308, A). He then vivifies the inner face of the loop thus made, and fixes the ligament in this position by means of three encircling sutures. Dudley, also operating by the abdomen, vivifies first a portion of the anterior surface of the uterus at each side, starting at the origin of the round ligaments,

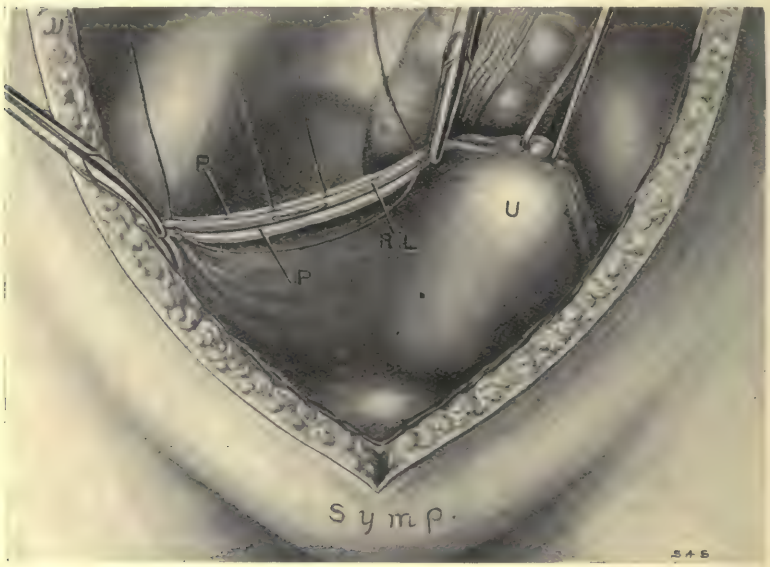


FIG. 309.—Intra-peritoneal shortening of the round ligament. The peritoneum covering the round ligament is split and stripped off the ligament, and the gathering sutures are inserted. P. Peritoneal flaps. R.L. Round ligament. U. Uterus.

and extending to about a thumb's breadth above the vesical reflection of peritoneum. The round ligament, freed from its peritoneal investment, is then sutured in the form of a V-shaped loop to this area by means of catgut sutures (*v.* Fig. 308, B).

We perform this operation in the following manner:—The round ligament is lightly caught with a clamp forceps close to its uterine insertion, and drawn out so as to make it taut. Its peritoneal covering is then quickly divided by running the point of a scalpel along it parallel to the fibres of the ligament, and

the fibres are exposed by slightly stripping the peritoneum off them with a blunt knife (*v.* Fig. 309). A suture is then passed through the ligament, first at its uterine end, avoiding the peritoneum, and then similarly through the ligament at a point near the internal abdominal ring, in such a manner that, when it is tied, it will bring the cornu of the uterus to within a short distance of the ring. A second suture is then passed through the ligament in a similar manner, so as to bring together the edge of the loop formed by the first suture. These sutures, when

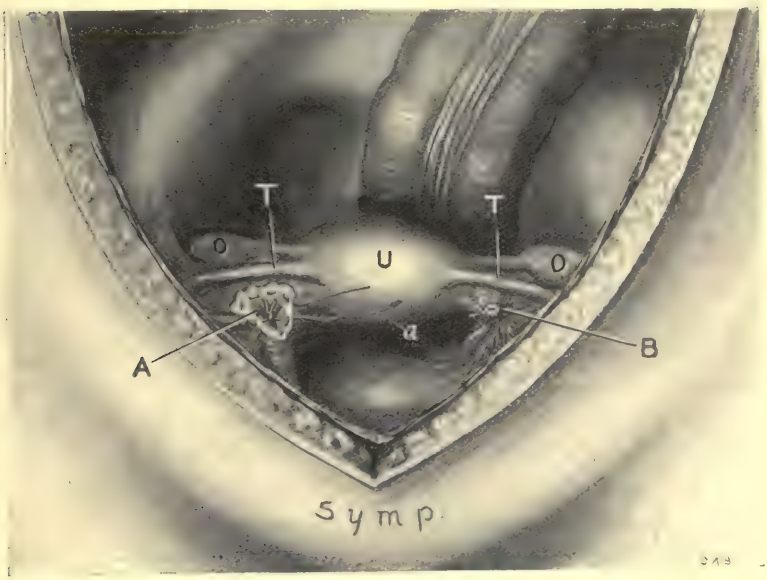


FIG. 310.—Intra-peritoneal shortening of the round ligaments. A. The gathering sutures on the ligament are tied, and the peritoneal suture is in position. B. The peritoneal suture tied. U. Uterus. T. Tube. O. Ovary. *a.* Peritoneal suture.

tied, bring the ligament together fibre to fibre, and so cause a stronger union than if a peritoneo-peritoneal union was effected. Finally, the peritoneum is drawn together over the shortened ligament with a catgut suture (*v.* Fig. 310).

Wertheim, operating through the vagina, shortens the ligaments in a manner very similar to that adopted by Wylie in the abdominal operation. After opening the utero-vesical pouch he catches the round ligament with a forceps, applied about two inches from the uterus, and draws it down. He then sutures together the sides of

the loop thus formed, and in some cases fastens the apex of the loop to the vaginal walls. If the latter course is adopted, the operation is almost identical in its effects with Vineberg's (*v.* page 471).

Complications.—In extra-peritoneal shortening it may sometimes be difficult or impossible to find the ligaments. This trouble can, however, always be overcome by opening the inguinal canal.

After-treatment.—After extra-peritoneal shortening the patient is kept in bed for fourteen days, while the stitches in the abdominal wound are removed at the end of eight days. It is sometimes recommended that the patient should wear a pessary for six weeks or two months after the operation. We have never adopted this precaution, and do not consider that it is necessary. The after-treatment, in cases of intra-peritoneal shortening, is similar to that of ventral or vaginal cœliotomy as the case may be (*v.* pages 299, 318).

VAGINAL INCISION AND DRAINAGE.

Vaginal incision and drainage is of value in order to evacuate collections of pus in the pelvis, and to afford drainage from the most dependent part of the peritoneal cavity in septic peritonitis.

Indications.—Vaginal incision is indicated in the following cases :—

(1) Localised collections of pus in Douglas' pouch or between the layers of the broad ligament.

(2) Cases of pyosalpinx or ovarian abscess in which the diseased appendages cannot be removed, either owing to adhesions or to the inability of the patient to undergo a serious operation. It is also indicated in acute infection as a preliminary to the removal of the appendages, with the object of lessening the risk of infection of the peritoneal cavity.

(3) General septic peritonitis.

Instruments.—The following instruments are required :—A scalpel, or a pair of long-handled scissors with sharp points ; Bozemann's catheter ; a posterior speculum ; two curved clamp forceps ; two American forceps ; six clip forceps ; a long-handled plugging forceps (*v.* Figs. 11, 146, 147, 149, 9).

Operation.—Commence by examining the patient carefully, especially by the rectum, in order to determine the relationship between the abscess, the rectum, and the posterior vaginal fornix. Then expose the last, by passing a posterior speculum. If the cervix is low down and fairly moveable, catch the posterior lip with an American forceps, and, by drawing the forceps downwards and forwards, place the mucous membrane of the fornix upon the stretch. A transverse incision is next made with the scalpel through the mucous membrane of the posterior fornix just behind the junction of the cervix and the vagina, and about an inch in length (*r.* Fig. 161). In most cases, it will then be possible to push the finger through the wall of the abscess, and so make a passage for the pus. If this cannot be done, a curved clamp forceps may be introduced instead of the finger, and the opening enlarged by drawing the forceps out with its blades apart. Then, with one finger in the cavity, make a careful bimanual examination with the object of ascertaining the relationship of the abscess to the pelvic viscera, and the existence of secondary pus-containing loculi. All these loculi must be carefully broken down with the finger, but every precaution must be taken not to break through the adhesions which limit the infection above. The cavity is then well washed out with an antiseptic lotion, and the best of these is, we think, peroxide of hydrogen. This may be made by diluting the ordinary full strength solution with an equal quantity or with three parts of water, so as to make a 50 per cent. or a 25 per cent. solution. If this lotion is used, the douching should be continued until the evolution of gas has almost ceased. The cavity is then plugged tightly with iodoform gauze (*r.* Fig. 143). Usually, there is tolerably free hæmorrhage, but this will stop when a vaginal plug is applied in addition to the plug in the cavity, and is supplemented by a firm compress and abdominal binder.

If the case is one of intra-ligamentous abscess, which is pointing at some part of the abdominal wall, the course of procedure must be somewhat modified. Open the abscess first where it is pointing, and then in many cases a finger can be passed downwards through the cavity to the bottom of the pelvis. With the finger in this position, it will be possible to thrust up a forceps through an incision in the posterior fornix into the cavity, which can then be

washed out by allowing a stream of lotion to run through it. In septic peritonitis, after abdominal cœliotomy and washing out of the peritoneal cavity, it is well to make a free opening into the vagina, in order to ensure good drainage, or even multiple openings through the abdominal walls, as have been already described (*v.* page 296). In washing out the peritoneal cavity, normal saline solution alone should be used.

Complications.—The principal complication which may occur is the wounding of the rectal wall while the incision is being made. If the opening is made too much to one side, there is a risk of wounding the ureter or uterine vessels.

After-treatment.—If the patient goes on well and her temperature is fairly normal, the gauze plug need not be removed for two or three days, but, if her temperature goes up, the plug must be removed the day subsequent to the operation. After it is removed, the cavity is well washed out and a fresh plug is inserted. This treatment is continued, and in a few days the size of the cavity will have become so much lessened that it will be possible to dispense with the plug in the cavity, and only necessary to place some gauze in the vaginal opening in order to keep the latter patent.

RADICAL TREATMENT OF PERITONEAL ADHESIONS.

It is frequently necessary to open the abdominal cavity in order to break down adhesions between the uterus, the appendages, and the surrounding parts. This can be done either by ventral or vaginal cœliotomy.

Indications.—Cœliotomy is indicated in order to break down adhesions when they cause uterine or ovarian symptoms of sufficient importance to justify the operation, and when they cannot be relieved by less radical treatment. It is also indicated in the case of adhesions which cause chronic or acute intestinal obstruction.

Inasmuch as such adhesions are usually associated with pathological conditions of the appendages, the abdominal route is the more suitable, as it affords a better view of the field of operation, and so enables more accurate measures to be taken than are possible by the vaginal route.

Instruments.—Similar instruments are required as for ventral or vaginal cœliotomy (*v.* pages 285, 307).

Operation.—There are no points in the operation to call for special remark. The abdominal cavity is opened by whatever route is thought best. Recent adhesions are broken down with the fingers. Fibrous adhesions of long standing are divided with the scalpel or scissors, bleeding vessels are tied, and the peritoneum is brought together so far as possible over raw surfaces. If the ovaries or tubes are adherent, they should be set free, and any necessary operations, such as salpingostomy or ovarian resection, performed. If the uterus was in a position of retro-deviation before the operation, it must be fixed in front by performing ventral or vaginal hysteropexy.

After-treatment.—The after-treatment is similar to that of vaginal or ventral cœliotomy as the case may be (*v.* pages 299, 318).

INDEX.

ABDOMINAL cœliotomy, 285—302
— examination of patient, 5
— hysterectomy, 411—447
— — partial, 412—426
— — total, 426—447
— hysteropexy, 464—468
— — in prolapse, 89, 90
— — in retro-deviations, 103, 104
— myomectomy and enucleation, 459—463
— wound, suture of, 290—294
Adeno-fibromyoma of uterus, 150
Adenoma of bladder, 30, 31
— of cervix, 146
— of ovary, 221—228
— of tube, 212
— of uterus, 137, 150
Adenomatous endometritis, 137
Adhesive vaginitis, 50
Alexander's operation, 499—503
Amenorrhœa, 20—22
— actual, 21
— apparent, 20, 21
— reflex, 22
— sympathetic, 22
American forceps, 14
Amputation of cervix, 381—389
— — supra-vaginal, 381—385
— — infra-vaginal, 385—389
— — in endocervicitis, 149
— — in prolapse, 89
Angeomatous degeneration of myoma, 157
Anteposition of uterus, 110, 111
Anterior colporrhaphy, 367, 368
— — in prolapse, 88, 89
— colpotomy, 309—316
— vaginal fixation, 468—472
— — — in prolapse, 89, 90
— — — in retro-deviations, 103
Anteversion and flexion, 107—111
Antiseptic, definition, 270
Antiseptics, 281—284
Artificial vesico-vaginal fistula, to make, 337
— — — value of, in cystitis, 29, 30
Ascent of ovary, 217
— of uterus, 78, 79
Aseptic, definition of, 270
Atmocausis, 397—403
— in acute endometritis, 132
— in hæmorrhagic endometritis, 142
— in tuberculosis of endometrium, 189
Atresia of genital passages, 260—263
— — — operations for, 369—372
Atrophic endometritis, 137
— oöphoritis, 204
Auto-suggestion, amenorrhœa due to, 22

BACKWARD displacements, 92—106
Bacterial theory of endometritis, 133
Ball's operation for pruritus vulvæ, 346, 347
Bandl's hollow sound, 142
Bartholin's gland, carcinoma of, 43, 44
— — cyst of, 46
— — removal of, 345, 346
Bimanual examination, method of performing, 6—12
— reposition of retro-deviated uterus, 97—101
Bladder, cystitis, 26—30
— diseases of, 26—33
— displacements of, 32, 33
— fistulæ of, 253—259
— — operations for cure of, 326—336
— tumours of, 30—32
— washing out of, 28, 29
Bozemann's catheter, 28
Braun's intra-uterine syringe, 141

Broad ligament, cysts of, 244—246
— — fibro-myomata of, 246
— — hæmatoma of, 246

Calcareous degeneration of myoma, 155, 156
Canal of Nuck, hydrocele of, 46, 47
Carcinoma of bladder, 31
— of clitoris, 43, 44
— of ovary, 228—230
— of tube, 212
— of urethra, 34
— of uterus, 167—177
— of vagina, 56, 57
— of vulva, 43, 44
Castration for myoma, 164
Catarrhal salpingitis, 196, 197
— vaginitis, 49—53
— vulvitis, 36, 37
Catgut, preparation of, 276—278
Catheters, sterilisation of, 275
Cavernous myoma, 157
Cervical dilatation, 15—17, 374—377
— dilators, 15—17
— metritis, 143—149
— — acute, 143, 144
— — chronic, 144—149
Cervix, amputation of, 381—389
— — infra-vaginal, 385—389
— — supra-vaginal, 381—385
— atresia of, 259—263
— carcinoma of, 173—177
— dilatation of, 15—17, 374—377
— division of, 392—397
— ectropion of, 148, 252, 253
— erosion of, 145—148
— inflammation of, 143—149
— laceration of, 252, 253
— sarcoma of, 177—181
— stenosis of, 64, 65
— suture of, 389—392
Chorio-epithelioma, 181—188
Chorio-sarcoma, 182
Clitoris, amputation of, 244, 345
— malignant disease of, 43, 44
Clover's crutch, 284
Cœliotomy, 285—318
— vaginal, 302—318
— ventral, 285—302
Colpocleisis, 373
— in vaginal fistulæ, 259
Colpo-perinæorrhaphy, 358—361
— in prolapse, 89
Colpotomy, 302—318
— anterior, 309—316
— posterior, 316, 317
Complex tumours of ovary, 234
Congenital absence of uterus, etc., 63, 64
— atresiæ, 259—263
— atrophy of uterus, 66
— hypertrophy of cervix, 67, 68
— stenosis of cervical canal, 64, 65
Corporeal metritis, 121—143
— — acute, 121—129
— — chronic, 129—143
Corpus luteum, cysts of, 221
Curette, as a means of diagnosis, 15
— different forms of, 377, 378
Curetting, 377—381
— as an aid to diagnosis, 15
— in endometritis, 140, 141
— in myoma uteri, 163, 164
— in salpingitis, 209, 210
Cystadenoma of ovary, 221—228
Cystic degeneration of myoma, 153—155
Cystic changes in Fallopian tube, 197—202
Cystitis, 26, 30
Cystocele, 249, 250
Cystoscope, Kelly's, 339
— Nitze's, 342
Cysts of Bartholin's gland, 46
— — — removal of, 345, 346
— of broad ligament, 244—246
— of corpus luteum, 221
— of ovary, dermoid, 231—234
— — proliferating, 221—228
— — retention, 220, 221
— of round ligament, 246, 247
— of vagina, 59—61
— of vulva, 46

Deciduoma malignum, 182
Dermoid cyst of bladder, 31
— of ovary, 231—234
Descent of ovary, 217, 218
— of uterus, 79—92
Dextroposition of uterus, 111, 112
Dextroversion and flexion, 111, 112
Diagnostic instruments, 13—17
— operations, 17
Diffuse intra-peritoneal hæmorrhage, 264—269
Dilatation of cervix, 15—17, 374—377
Displacements of ovaries, 216—219
— of uterus, 69—120

Displacements of uterus, backward, 92—106
— — downward, 79—92
— — forward, 107—111
— — inversion, 113—120
— — lateral, 111, 112
— — list of, 74
— — torsion, 113
— — upward, 78, 79
Division of cervix, 392—397
— — bilateral, 393, 394
— — posterior, 394—397
Double uterus, 64
Doyen's abdominal hysterectomy, 427—433
— anterior retractor, 307
— broad ligament clamps, 448
— crotchet, 427
— myoma extractor, 412
— needle-holder, 293
— ovarian extraction forceps, 306
— posterior speculum, 305
— retractor, 286
— vaginal hysterectomy, 457, 458
Drainage in cœliotomies, 294—299
— vaginal, 297, 298
Dressings, sterilisation of, 272, 273
Dudley's operation for vesico-vaginal fistula, 332, 333
— operation for urinary incontinence, 323—326
— posterior division of cervix, 396, 397
— shortening of round ligaments, 503
Dührssen's anterior colpotomy, 315, 316
— vaginal hysteropexy, 470, 471
Dysmenorrhœa, 23, 25
— cause of, in cervical stenosis, 64, 65
— exfoliative, 25
— membranous, 25

ECTROPION, 148, 252, 253
Eczema of vulva, 38, 39
Electrolysis for myomata, 163
Elephantiasis, 42
Emmet's trachelorrhaphy, 391, 392
Emphysematous vaginitis, 54, 55
Endometritis, acute, 120—129
— chronic, 132—143
— glandular, 135
— hæmorrhagic, 136
— interstitial, 136
— mixed, 136
Endosalpingitis, 193—197
Endothelioma of ovary, 231
— of uterus, 181
— of vagina, 59
Enucleation of myomata, 165, 462, 463
Episiorrhaphy, 373
Ergot in myomata, 162
Erosion of cervix, 145—148
Exfoliative dysmenorrhœa, 25
— endometritis, 139
Extra-peritoneal hæmorrhage, 269, 270
Exudative vaginitis, 53, 54
— vulvitis, 37, 38

FALLOPIAN tubes, absence of, 214, 215
— — diseases of, 190—215
— — inflammatory diseases of, 190—212
— — new growths of, 212
— — operations on, 474—479
— — tubal pregnancy, 214
— — tuberculosis of, 212—214
Fatty degeneration of myoma, 153
Fergusson's speculum, 14
Fibro-adenoma of uterus, 150
Fibro-cystic tumour of bladder, 30
— — of uterus, 153—155
Fibroma of ovary, 230
— of urethra, 34
Fibro-myoma of broad ligament, 246
— of round ligament, 247
— of uterus, 150—167
— — changes in, 153—158
Fistula forceps, 306
Fistulæ, 253—259
— operations for, 326—336
Fixation of uterus in retro-deviations, 103, 104
Flexible rubber pessary, 85
Flexion of the uterus, definition of, 69—71
Follicular erosion, 147
— hypertrophy of cervix, 147
— salpingitis, 199, 200
Forward displacements of uterus, 107—111

GEHRUNG'S pessary, 86
Graafian follicle, cyst of, 220, 221
Granular vaginitis, 50
— vulvitis, 36
Gynæcological couch, 5

HÆMATOCELE, 264—269
Hæmatocolpos, 261

Hæmatoma of broad ligament, 246
— of vagina, 66
— of vulva, 45, 46
Hæmatometra, 261
Hæmatosalpinx, 201
Hands, sterilisation of, 280, 281
— care of, 251
Hegar's colpo-perinæorrhaphy, complete, 363—366
— — incomplete, 358—361
— curette, 378
— dilators, 16, 17
Herniæ, 46
— of ovary, 217
Herpes of vulva, 38
History of the patient, 1—5
Hodge pessary in prolapse, 85, 86
— — in retro-deviations, 101, 102
Hollow vulcanite ring pessary, 85
Hydrocele of canal of Nuck, 46, 47
Hydrops folliculi, 220
— tubæ profluens, 199, 200
Hydrosalpinx, 199
Hypertrophic oöphoritis, 204
Hypertrophy of cervix, congenital, 67, 68
Hysterectomy, 411—463
— in carcinoma uteri, 171
— Doyen's, 427—433
— in inversion, 120
— Kelly's, in myoma, 419—423
— — in carcinoma, 433—442
— — in inflammatory disease of appendages, 424—426
— in myomata, 164, 165
— in prolapse, 90, 91
— in salpingo-oöphoritis, 212
— Schroeder's, 413—419
— vaginal, 447—463
— — with clamps, 454—456
— — with sutures, 448—454
— — with mutilation of uterus, 456—459
— ventral, 411—447
— Werder's, 442—447
Hysteropexy, 463—472
— in prolapse, 89, 90
— in retro-deviations, 103, 104
— vaginal, 468—472
— ventral, 464—468

IGNIPUNCTURE of ovary, 490—493
Imperforate hymen, 260
Imperforate hymen, excision of, 346
Infancy, period of, 2
Infantile uterus, 66, 67
Inflammatory diseases of ovaries, 203, 204, 219
— — of tubes, 190—212
— — of uterus, 121—149
— — of vagina, 49—55
— — of vulva, 35—38
Inguinal hernia, 46
Instruments, sterilisation of, 273—275
Interstitial endometritis, 136
— oöphoritis, acute, 203
— — chronic, 204
— salpingitis, 197
Intestinal diverticulum, 205, 206
Intra-peritoneal hæmorrhage, 264—269
Inversion of uterus, 113—120
— — acute, 114, 115
— — chronic, 115—120
— — — radical cure of, 472, 473
Iodine reaction in tubal inflammation, 208
Iodised phenol, 141
Iodoform gauze, as a means of dilating the cervix, 16

KELLY'S cystoscope, 339
— hysterectomy for malignant disease, 433—442
— hystero-myomectomy, 419—423
— method of splitting the uterus, 424—426
— ventral hysteropexy, 464—467
Kocher's ventral fixation, 467, 468
Kolpo-hyperplasia cystica, 54, 55
Küstner's operation for inversion, 472, 473

LABIO-VAGINAL herniæ, 46
Labium, tumours of, 43, 44
— — removal of, 346
Laminaria tents, 15, 16
— — to sterilise, 275
Lateral displacements of uterus, 111, 112
Lawson Tait's perinæorrhaphy, complete, 361—363
— — incomplete, 350—352
— — scissors, 348
Leucocytosis in tubal inflammation, 208
Levator ani, suture of, 353—356

MACKENRODT'S anterior colpotomy, 309—315

Mackenrodt's operation for vesical fistulæ, 333, 334
— — table, 283, 284
— vaginal hysteropexy, 468—470
Malignant degeneration of myoma, 158
Martin's curette, 328
— needles, 293
— posterior speculum, 304
Massage in salpingo-oöphoritis, 210
Membranous dysmenorrhœa, 25
Menopause, 2
Menorrhagia, 22, 23
— reflex, 23
Menstrual history, in diagnosis, 3, 4
Menstruation, pathology of, 18—25
— physiology of, 18—20
Metritis, cervical, 143—149
— corporeal, 121—143
Metrorrhagia, 22, 23
Meyer's ring pessary, 85
Microscope as an aid to diagnosis, 17
Mikulicz's bag, 298, 299
Mixed cysts of ovary, 234
Morcellation of myomata, 404
Müller's vaginal hysterectomy, 456, 457
Mycotic vaginitis, 51, 52
Myoma of bladder, 31
— of ovary, 230
— of tube, 212
— of urethra, 34
— of uterus, 150—167
— — submucous, removal of, 403—406
Myomectomy, 459—462
Myometritis, acute, 121—129
— chronic, 129—132
Myxomatous degeneration of myoma, 153

NABOTHIAN follicle, 145
Necrosis of myoma, 153
Nitze's cystoscope, 342
Nodal cell, 234
Nodular salpingitis, 197
Normal positions of uterus, 74—78
Nott's speculum, 14

OLSHAUSEN'S ventral hysteropexy, 467
Oöphorectomy, 487—490
— for myomata, 164
Oöphoritis, 203, 204
— acute, 203
— chronic, 203, 204
Oöphorocele, 217
Operating room, 272
— table, 283, 284
Ovariotomy, 479—487
Ovary, absence of, 214, 215
— displacements of, 216—219
— examination of, 8—11
— inflammation of, 203, 204, 219
— new growths of, 219—238
— — — complex tumours, 234
— — — dermoid tumours, 231—234
— — — epithelial tumours, 221—230
— — — mesoblastic tumours, 230, 231
— — — retention cysts, 220, 221
— — — teratomata, 231—234
— tuberculosis of, 238

PAGET'S method of treating uterine prolapse, 91
Papillary erosion, 147
— cyst of ovary, 221—228
Papilloma of bladder, 30
— of ovary, 221—228
— of tube, 212
Paravaginal section, 318—321
Parenchymatous metritis, *v.* Myometritis
— oöphoritis, 203
Parthenogenesis, 233, 234
Patient, history of, 1—5
— physical examination of, 5—17
— preparation of, for operation, 278, 279
Péan's cyst forceps, 480
— hysterectomy forceps, 306
— vaginal hysterectomy 454—456
Péan-Segond's compression forceps, 448
Pedicle needles, 306
Pelvic cellulitis, 242—244
— examination of patient, 5—13
— peritonitis, 239—242
Perinæal hernia, 46
Perinæorrhaphy, 347—367
— complete, 361—367
— incomplete, 350—361
— in prolapse, 88, 89
Perinæum, 47, 48
— lacerations of, 248—253
— operations on, 347—367
Perithelioma of ovary, 231
Peritoneal adhesions, cœliotomy for, 508, 509
— — Schultze's treatment of, 408—410
Peritonitis, pelvic, 239—242

Pessaries, 83—86
Pfannelstiel's operation for vaginal atresia, 370, 371
Phlegmonous vaginitis, 54
— vulvitis, 38
Physical examination of patient, 5—17
Post-operative complications, 301, 302
Procidentia uteri, 79—92
Prolapse of ovary, 217—219
— of urethral mucous membrane, 34, 323
— of uterus, 79—92
Proliferating cyst of ovary, 221—228
Protargol, in acute metritis, 128, 129
— in cystitis, 28
Pruritus vulvæ, 40—42
Puberty, period of, 2
Pyosalpinx, 199

QUÉNU'S vaginal hysterectomy, 456, 457
— abdominal retractor, 287

RECTAL examination, 11, 12
Rectocele, 250, 251
Red degeneration of myoma, 157, 158
Reflex amenorrhœa, 22
— menorrhagia, 23
Reposition of acute inversion of uterus, 115
— of chronic inversion, 118—120
— of prolapsed uterus, 83
— adherent retro-deviation, 408—410
— of retro-deviated uterus, 97—101
Repositor for inverted uterus, 118
Resection of ovary, 490—493
Retention cysts of ovary, 220, 221
— — of vulva, 46
— — removal of, 245, 346
Retroposition of uterus, 106
Retro-uterine hæmatocele, 263—269
Retroversions and flexions, 92—106
Rheinstädter's curette, 379
Ring pessary, 85
Round ligaments, cysts of, 246, 247
— — fibroma of, 247
— — fixation of, ventral, 467
— — — vaginal, 471, 472
— — shortening of, extra-peritoneal, 499—503
— — — intra-peritoneal, 503, 504
Rubber gloves, use of, 280, 281
— — sterilisation of, 273
Rutherford Morison's operation for vesical fistula, 329—331

SALPINGECTOMY, 474—478
Salpingitis, 192—202
— acute, 192—196
— chronic, 196—202
Salpingocele, 217
Salpingo-oöphorocele, 217
Salpingostomy, 478, 479
Salpingo-oöphorectomy, 487—490
— for inflammation, 211, 212
— for myomata, 164
Salpingo-oöphoritis, 190—212
Sänger's operation for vesico-vaginal fistula, 328, 329
— trachelorrhaphy, 389—391
Sarcoma of bladder, 31
— deciduo cellulare, 182
— of ovary, 230, 231
— of tube, 212
— of urethra, 34
— of uterus, 177—181
— of vagina, 58, 59
— of vulva, 44
Schroeder's amputation of cervix, 386—389
— cervical zones, 81
— hysterectomy, 413—419
Schuchardt's paravaginal section, 318—321
Schultze's method of replacing an adherent retro-deviation, 408—410
— spoon forceps, 404
Sea-tangle tents, 15, 16
— — to sterilise, 275
Segond's retractor, 307
Senile vaginitis, 50
Shortening of the round ligaments for prolapse, 90
— — — for retro-deviation, 104, 105
— — — extra-peritoneal, 499—503
— — — intra-peritoneal, 503, 504
— — — vaginal, 504
Silk, preparation of, 275, 276
Silkworm gut, to prepare, 276
Simon - Marckwald's amputation of cervix, 389
Simple vaginitis, 50
— vulvitis, 36
Simpson's division of cervix, 393, 394
Sims' curette, 378
— operation for vesico-vaginal fistulæ, 327, 328
— position, 12
— posterior division of cervix, 394—396

Sims' speculum, 12
— treatment of inoperable malignant disease, 407, 408
— vaginal dilators, 56
Sinistroposition of uterus, 111, 112
Sinistroversion and flexion, 111, 112
Smith-Hodge pessary for prolapse, 85, 86
— — for retro-deviation, 101, 102
Smyly's modification of Schultze's spoon-forceps, 404
Solid vulcanite ring pessary, 85
Sound, uterine, 14, 15
Speculum, 13, 14
— posterior, 304, 305
Sponge tents, 16
Sponges, 273
Stenosis of cervix, 64, 65
Sterile, definition of, 271
Sterilisation, definition of, 272
— of dressings, 272, 273
— of field of operation, 278, 279
— of hands, 280, 281
— of instruments, 273—275
— of sponges, 273
— of suture materials, 275—278
Sterility, cause of, in anteflexion, 109, 110
— — in cervical stenosis, 65
Submucous myoma, removal of, 166, 403—406
Super-heated steam, use of, 397—403
Surgical cleanliness, definition of, 272
Suspension of uterus, *v.* Hysteropexy
— in retro-deviation, 103, 104
Sutures, preparation of, 275—278
Sympathetic amenorrhœa, 22

Tents, 15, 16
Teratoma of ovary, 231—234
Thomas's pessary, 84
Torsion of pedicle of ovarian cyst, 486
— of tube, 202
— of uterus, 113
Trachelorrhaphy, 389—392
— Emmet's, 391, 392
— Sänger's, 389—391
Traumatic lesions of genital tract, 248—259
— — of cervix, 252, 253
— — of perinæum, 251—253
— — of vagina, 61, 62
Trendelenburg's operation for vesical fistula, 334
Trendelenburg's position, 279
Tubal pregnancy, 214
Tuberculosis of ovary, 238
— of tube, 212—214
— of uterus, 188, 189
— of vagina, 62
— of vulva, 47
Tumours of bladder, 30—32
— of ovary, 219—238
— of tube, 212
— of uterus, 150—188
— — benign, 150—167
— — malignant, 167—188
— of vagina, 56—61
— — false, 59—61
— — true, 56—59
— of vulva, 43—47
— — false, 45—47
— — true, 43—45
Tupelo-wood tents, 16
Tympanites, post-operative, 301

Undescended ovary, 217
Ureteral fistulæ, 254—259, 336
Urethra, diseases of, 33, 34
— fistulæ of, 254—259, 336
— prolapse of mucous membrane, 34, 323
— tumours of, 34
— vascular caruncle of, 33, 34
— — — removal of, 322, 323
Uterine sound, 14, 15
Utero-sacral ligaments, shortening of, 494—499
— — intra-peritoneal, 494—498
— — extra-peritoneal, 498, 499
Uterus, backward displacements of, 92—106
— carcinoma of, 167—177
— chorio-epithelioma of, 181—188
— congenital absence of, 63, 64
— — atrophy of, 66
— displacements of, 69—120
— double, 64
— downward displacements of, 79—92
— endothelioma of, 18
— errors of development of, 63—68
— examination of, 6—8
— fibro-myomata of, 150—167
— fixation of, 463—472
— forward displacements of, 107—111
— infantile, 66, 67
— inflammatory diseases of, 121—149

Uterus, inversion of, 113—120
— lateral displacement of, 111, 112
— major operations on, 411—473
— minor operations on, 324—410
— new growths of, 150—188
— normal positions of, 74—78
— prolapse of, 79—92
— removal of, 411—459
— sarcoma of, 177—181
— torsion of, 113
— tuberculosis of, 188, 189
— tumours of, 150—188
— — benign, 150—167
— — malignant, 167—188
— upward displacement of, 78, 79

VAGINA, atresia of, 259, 263
— cysts of, 59—61
— diseases of, 49—62
— errors of development of, 62
— hæmatoma of, 61
— inflammation of, 49—55
— traumata of, 61, 62
— tuberculosis of, 62
— tumours of, 56—59
Vaginal cœliotomy, 302—318
— — anterior, 309—316
— — posterior, 316, 317
— drainage, 297, 298
— fluid, nature of, 50
— hysterectomy, 447—459
— — clamp operation, 454—456
— — Doyen's operation, 456, 459
— — Müller's operation, 456, 457
— — Péan's operation, 454—456
— — Quénu's operation, 456, 457
— — suture operation, 448—454
— hysteropexy, 468—472
— — in prolapse, 89, 90
— — in retro-deviations, 103, 104
— orifice, incision of, 369
— tumours, removal of, 369
Vaginismus, 55, 56
Vaginitis, 49—55
— catarrhal, 49—53
— emphysematous, 54, 55
— exudative, 53, 54
— phlegmonous, 54
Vascular caruncle of urethra, 33, 34
— — removal of, 322, 333
Veit-Schroeder gynæcological chair, 5
Ventral cœliotomy, 285—302
— hysterectomy, 411—447
— hysteropexy, 464—468
— myomectomy and enucleation, 459—463
Version of the uterus, 68—71
Vesico-cervical fistulæ, 254—259, 336
Vesico-uterine fistulæ, 254—259, 336
Vesico-vaginal fistulæ, 254—259
— — artificial, in cystitis, 29, 30, 337
— — operations for cure of, 326—336
— — — Dudley's, 332, 333
— — — Mackenrodt's, 333, 334
— — — Rutherford Morison's, 329—331
— — — Sänger's, 328, 329
— — — Sims', 327, 328
— — — Trendelenburg's, 334
Vineberg's operation for vaginal atresia, 370, 371
— vaginal fixation of round ligaments, 471, 472
Volsellum, large, 403
— small, 14
Vulva, diseases of, 34—48
— eczema of, 38, 39
— elephantiasis of, 42
— herpes of, 38
— inflammation of, 34—38
— kraurosis of, 42, 43
— pruritus of, 40—42
— tuberculosis of, 47
— tumours of, 43—47
Vulvitis, 34—38
— catarrhal, 36, 37
— exudative, 37, 38
— granular, 36
— phlegmonous, 38
— simple, 36

WASHING out bladder, method of, 28, 29
Werder's hysterectomy, 442—447
Wertheim's shortening of round ligaments, 504
Wylie's shortening of round ligaments, 503

ZESTOCAUSIS, 397—403

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